

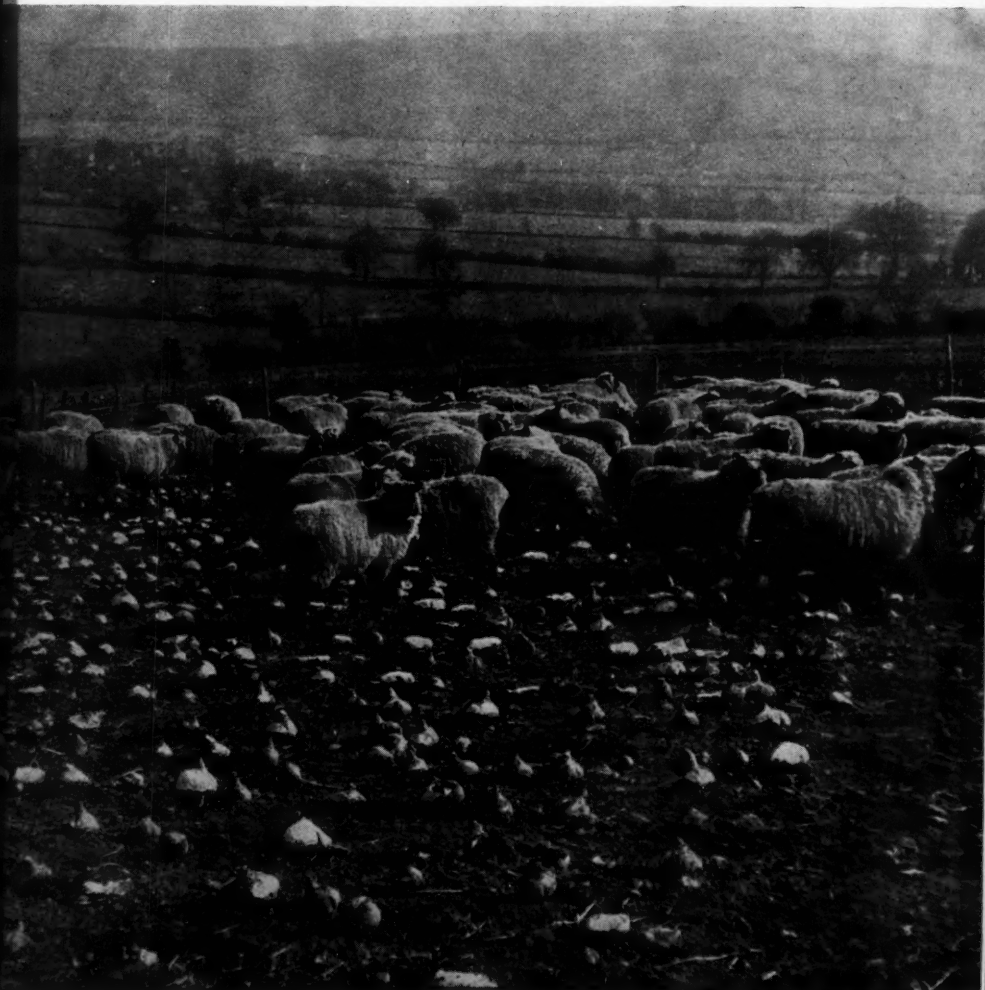
# agriculture

Vol. 76 No. 7

July 1969

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Swedes as a Break Crop

page 309

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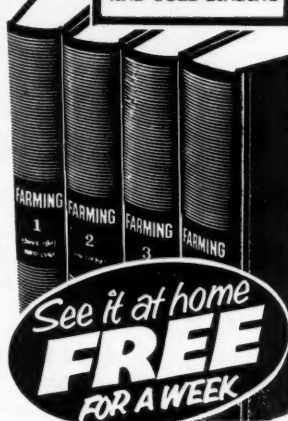
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# Agriculture

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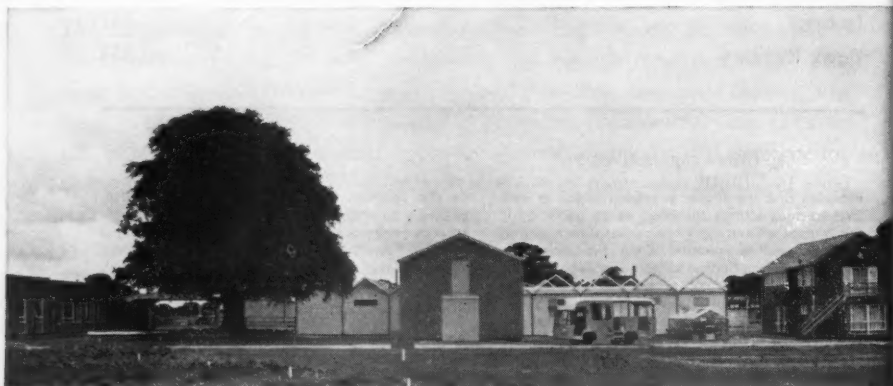
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## Swedes

### as a Break Crop

R. Hart

---

THE search for a satisfactory cereal break crop continues. In recent years there has been a large increase in the acreage of beans and oilseed rape and we are now seeing a move into vegetable crops on a field scale. On the other hand the acreage of swedes, once by far the most important break crop, continues to decline. But developments over the last few years have made swedes a crop which is easy and cheap to grow and which can be utilized through fattening store lambs to yield very satisfactory margins. Used in this way there may well be situations where a return to swedes would go some way towards relieving the problems caused by intensive cereal growing.

#### Couch and wild oat control

Two of the most serious problems arising from intensive cereal growing are wild oats and couch grass. Because swedes do not need to be sown before late May, or even later if some yield loss is accepted, there is a good opportunity to carry out cleaning operations. Cultivations can be carried out whenever soil conditions permit from the time of harvesting the previous crop until three weeks before the target sowing date for swedes. At this time the aim should be to have the seedbed ready. Another crop of weeds will then germinate which can be killed off by spraying with a diquat/paraquat mixture; the crop is precision drilled immediately after spraying. Provided that no further soil disturbance takes place there will be little regrowth of broad-leaved weeds.

The success of this stale seedbed technique depends on soil moisture conditions being suitable for the germination of the weed seeds. If this does not happen or if late cultivations for perennial weed control are required, a soil acting herbicide, proprachlor, is now available.

Precision drilling at 4-7 inches is very successful and completely eliminates the need for hand work. Experimental work has shown that within wide limits the spacing between plants does not affect the total yield per acre. If the crop is to be grazed off it is better to have a large number of small roots as they tend to be more winter hardy. On farms where a precision drill has no other use, co-operative ownership can work very well.

### **Other considerations**

Swedes are a complete break as far as cereal diseases are concerned. The growing of the crop will not cause any labour peak and utilization by grazing from November onwards is also at a time when labour is generally available. Folding off with sheep can be far from pleasant in the depths of winter. However, the use of a two-strand electric fence in place of the traditional hurdles is both easier and pleasanter.

After grazing off, the land is left in a high state of fertility—the 'golden hoof' of other days. A small saving in fertilizer costs for the following crop will be made but the longer term advantages are not so easily measured.

The main disadvantage of swedes as a break crop is that they are not cleared in time for winter cereals. Indeed, on some soils the following spring cereal may have to be drilled later than normal if sheep are kept on until late in the winter. This point will be dealt with again later.

Capital requirements for the purchase of store lambs are also considerable although this money is turned over quite quickly.

### **Fattening sheep**

From 1966 to 1968 a group of farmers in south-west Shropshire kept records of their sheep fattening enterprises. On most of these farms swedes are not looked on as the sole break crop as most of them have considerable acreages of grass, but as a profitable crop in their own right. Soil and moisture conditions in the Welsh borders are very suitable for the crop.

All the following figures have been taken from these records, which covered some 147 acres of swedes. Recording started with the purchase of store lambs, generally in October, or with the valuation of home-bred lambs which were already on the farm at that time. Nearly all the lambs involved were Cluns or Clun crosses, purchased locally, although some farmers preferred small Welsh cross lambs. Folding generally started about mid-November when grass was no longer available and after a few days the sheep were kept entirely on the swede field. Concentrate and hay feeding normally started at low levels immediately. Lambs were sold fat throughout the period from mid-December to mid-April, February seeing the peak killings.

### **Financial results**

In 1966/67 the average gross margin per acre was £72 (excluding hay costs) and in 1967/68 it was £64. In both years there was a wide range of results but only three fields out of 19 failed to reach a gross margin of £40 per acre.

Several factors interact in determining the margin per acre achieved, namely:

1. Yield of swedes.
2. Cost of store lambs.
3. Price of fat lambs.
4. Variable cost of the crop.
5. Liveweight gain of the lambs.
6. Cost of concentrates and hay.

Of these factors the first three are by far the most important.

*Yield of swedes.* This was measured in terms of the lamb grazing days (l.g.d.) provided. Over the two years this averaged 3,800 per acre, i.e., one acre kept 100 lambs for 38 days. The major factor in obtaining a high yield is the drilling date which should be not later than the end of May. Crops drilled in late May averaged approximately 5,000 l.g.d. per acre whereas crops drilled about the end of June yielded only 3,000 l.g.d. per acre.

*Cost of store lambs.* Prices in the autumn obviously vary from year to year or indeed from week to week. Because large numbers of lambs are needed per acre a small change in the price of store lambs can make a big difference to the final margin per acre. A rise of 10s. per lamb can reduce margins per acre by £20 so there is clearly scope for the skilful purchaser who is prepared to shop around for his lambs. Good store lambs are necessary for success, whereas unthrifty ones could lead to financial failure.

*Price of fat lambs.* The market price rises throughout the winter, especially from Christmas onwards, until a steady supply of spring lamb is available to the butcher in April. It is this rising price which is the crux of the success of a lamb fattening enterprise. The longer lambs are kept, the greater will be the gross margin per lamb. After about a month on swedes most store lambs are fit enough to kill, so the choice of when to sell is governed by other factors. In many cases, as suggested earlier, the overriding consideration will be the need to get the sheep off the land in time to prepare a seedbed for the following crop. This could be the beginning of January on some of the heavier soils or as late as the end of March on some light soils. Clearly the farm selling early will be able to keep more lambs per acre on a comparable crop, but it is unlikely that this will compensate for the rapidly increasing price obtainable later. As with buying store lambs, a good deal of skill is involved in deciding the best time to sell.

*Variable cost of the crop.* Almost without exception the crop husbandry of the farms in the survey followed the stale seedbed technique outlined previously, that is, precision drilling and no hand work. Variable costs of the crop were recorded in the first year only and averaged £7 per acre, ranging from under £4 to over £12 depending mainly on the amount of fertilizer used.

*Liveweight gain and cost of concentrates and hay.* The performance of the lambs in terms of growth varies a great deal, the bigger store lambs generally doing better than smaller ones. The records showed that rarely did the liveweight gain (estimated) exceed one quarter of a pound per day and it was impossible to find any relationship between performance and the amount of concentrate fed or between performance and margins per acre. As



explained on p. 311 buying and selling prices per pound are most important. It must also be remembered that the price per pound received is likely to fall when once the lambs get over 50 lb dressed carcase weight. Hay consumption varies mainly according to the severity of the weather and can be quite high when long spells of frost and snow are experienced.

## Targets

The following targets summarize an enterprise based on fattening store lambs. The crop can be used for feeding purchased store lambs or for finishing the lambs of an intensive grassland ewe flock, grass and swedes together providing a break.

	Target
Drilling date	30th May—earlier in drier parts of the country
Yield	4,500 l.g.d. per acre
No. of lambs	45 per acre
Grazing starts	mid-November
Approximate selling date	mid-February (100 days)
Cost of store lamb	£6
Price of fat lamb	£8 10s.
Concentrate cost	10s. per lamb
Hay cost	5s. per lamb
Margin per lamb	£1 15s.
Variable costs of swedes	£10 per acre
Gross margin	£62 per acre
(allowing for losses)	

---

This article has been contributed by **R. Hart, B.Sc., (Agric.), Dip. Farm Man.**, a District Agricultural Adviser for the N.A.A.S. in the Eastern Region.

## Jealott's Hill

### Agricultural Research Station

At the beginning of January, the University of Reading announced that it had recognized I.C.I.'s Agricultural Research Station at Jealott's Hill, Berkshire, as an Associated Institution of the University. The title of Visiting Professor was conferred on Dr. W. R. Boon, Director of the Research Station. Dr. Boon has now resigned the title on his appointment as an additional Managing Director of Plant Protection Limited and has been succeeded as Director of Jealott's Hill Research Station by Dr. J. T. Braunnholtz. A recommendation that the title of Visiting Professor be conferred on Dr. Braunnholtz was ratified by the Council of the University on 30th May, 1969.

# Least Cost Pig Rations

B. Bastiman, *Great House Experimental Husbandry Farm*

THE cost of food represents up to 80 per cent of the costs of pig production. Since this cost is so proportionately high it is the one aspect that gives the most scope for saving. A five per cent reduction in food cost may outweigh a 50 per cent saving in labour.

In a recent series of experiments carried out at Trawscoed and Great House Experimental Husbandry Farms, together with work done at the University College of North Wales, the main aim was to investigate the possibility of reducing the cost of pig feeding. The chemical analyses and costs of a whole range of ingredients were fed into a computer to produce the cheapest combination which would provide the nutritional requirements of fattening pigs.

## Ration composition

Of the many combinations produced, four possibilities were tested at the two E.H.F.s. These combinations had the following composition:

	<i>Barley and weatings</i> %	<i>Maize</i> %	<i>Wheat</i> %	<i>Maize and weatings</i> %
<i>Weaner ration</i>				
Cereal .. ..	75 (barley)	76 (maize)	85 (wheat)	50 (maize)
Weatings .. ..	15	—	—	40
Soya bean meal ..	—	20	—	—
White fish meal ..	10	4	—	—
Herring meal ..	—	—	10	10
Meat meal ..	—	—	5	—
Cost per ton ..	£29 15s. 6d.	£31 14s. 3d.	£29 10s. 3d.	£30 16s. 10d.
	%	%	%	%
<i>Fattening ration</i>				
Cereal .. ..	81 (barley)	84 (maize)	92 (wheat)	65 (maize)
Weatings .. ..	15	—	—	30
Soya bean meal ..	—	16	—	—
White fish meal ..	4	—	8	5
Cost per ton ..	£26 13s. 10d.	£29 0s. 1d.	£27 11s. 5d.	£28 8s. 4d.

These rations were fed on different scales so that, for each treatment, pigs of the same weight received the same daily amounts of digestible energy, crude protein and lysine. At Great House the pigs were trough fed, with two pints of water added per lb meal while at Trawscoed the pigs were floor fed.

The daily liveweight gains in pounds for each treatment were as follows:

				Liveweight gains			
				<i>Barley and weatings</i>	<i>Maize</i>	<i>Wheat</i>	<i>Maize and weatings</i>
<b>Great House</b>							
Trial 1	..	..	—		1.28	1.14	—
Trial 2	..	..	1.32		1.32	1.26	1.25
<b>Trawscoed</b>							
Trial 1	..	..	1.24		1.28	1.29	1.23
Trial 2	..	..	1.29		1.32	1.30	1.24

In general there were only small differences between the four treatments, but the ration based on maize tended to give the best liveweight gains, whereas the one based on maize and weatings was inclined to give the worst.

### Economic results

If the results of these experiments are put into economic terms the picture changes. Results in terms of margin per pound of carcase over the cost of meal take into account the cost of the rations, together with the efficiency of conversion and their effects on killing out percentage and carcase grading.

The margins in pence per pound of carcase over feed costs were:

				<i>Barley and weatings</i>	<i>Maize</i>	<i>Wheat</i>	<i>Maize and weatings</i>
<b>Great House</b>							
Trial 1	..	..	—		14.0	15.2	—
Trial 2	..	..	15.5		15.2	16.0	14.8
<b>Trawscoed</b>							
Trial 1	..	..	13.2		13.7	15.3	13.2
Trial 2	..	..	12.7		12.4	13.5	11.5

These results show that the ration based on wheat left the highest margin because, although it did not give such rapid gains as that based on maize, it did not cost as much.

### Change-overs

The margins given over were based on the costs of the ingredients of the various rations at a given time. Should prices fluctuate it would be advisable to change rations quickly, so that the more profitable kind was always being fed. For example, the ration based on maize would be the most profitable if the price of maize fell relative to that of wheat.

To be able to take advantage of changes in ingredient costs it would be necessary to make rapid and frequent changes in pig diet. A series of experiments, therefore, were carried out to assess the effects of such changes on pig performance. The following treatments were compared:

Great House	Trawscoed
Barley throughout	Barley throughout
Barley alternating with wheat	Barley alternating with maize
Barley alternating with maize	Barley alternating with oats
Barley, then wheat, then maize, in sequence	Barley, then maize, then oats, in sequence

Composition of the rations:

	Great House			Trawscoed		
	Barley	Wheat	Maize	Barley	Maize	Oats
	%	%	%	%	%	%
Cereal	75	85	76	84	76	92
Weatings	15	—	—	—	—	—
Soya	—	—	20	11	20	—
White fish meal	10	—	4	5	4	8
Herring meal	—	10	—	—	—	—
Meat meal	—	5	—	—	—	—

On those treatments involving changes in rations these were made abruptly at fortnightly intervals, and no attempt was made to wean pigs from one ration to another.

The daily liveweight gains for each treatment were as follows:

Liveweight gains				
Great House	Barley	Barley: Wheat	Barley: Maize	Barley: Wheat: Maize
	1.32	1.33	1.31	1.32
Trawscoed	Barley	Barley: Maize	Barley: Oats	Barley: Maize: Oats
Trial 1	1.33	1.34	1.28	1.38
Trial 2	1.34	1.33	1.28	1.22

These results show that, apart from some reduction in growth rate where oats were fed, there were no disadvantages in rapid changes in diet. There were no digestive troubles, nor did any pigs refuse their rations.

From these experiments, therefore, it can be seen that rations produced by a computer on a least cost basis give satisfactory performances when fed to pigs. Should prices of feedingstuffs change so that it would be necessary to change the diet of pigs in order to obtain maximum profit, the indications are that such changes can be made quickly and frequently, without leading to any reduction in pig growth rates.



SOUTH-WEST ELEVATION

## Cow Cubicles for the Larger Herd



I. B. Mathieson

---

THE East Anglian dairy complex of Strutt and Parker (Farms) Ltd. and Lord Rayleigh's Farm Incorporated is well known both for its pedigree British Friesian stock and for its dairies which retail over 2½ million gallons of milk a year from twenty-six commercial units. Although the herds, which range in size from fifty to 240 cows, are under the same overall financial control, they are individually managed as separate enterprises.

The largest of these is the commercial herd at Thorpe Morieux, a few miles outside the beautiful Suffolk village of Lavenham. Until 1966, there were three commercial herds housed in old-fashioned buildings where heavy labour charges were gradually reducing profits to an unacceptably low level. Now the herds are amalgamated and the cows live all the year round in a modern 240-cow cubicle house with an integrated 12-unit herringbone milking parlour.

The decision to amalgamate the three herds was taken in the autumn of 1963 and after a farm visit to Cheshire the following January, it was decided to instal 200 cubicles at Grange Farm, one of the original dairy homesteads.

The advice of the N.A.A.S. and the A.L.S. was sought, and the results of a farm management exercise and Strutt and Parker's own computer survey



suggested a more ambitious plan on an entirely new site, including a larger 240-cow unit, fed throughout the year in the cubicle house on high dry matter silage.

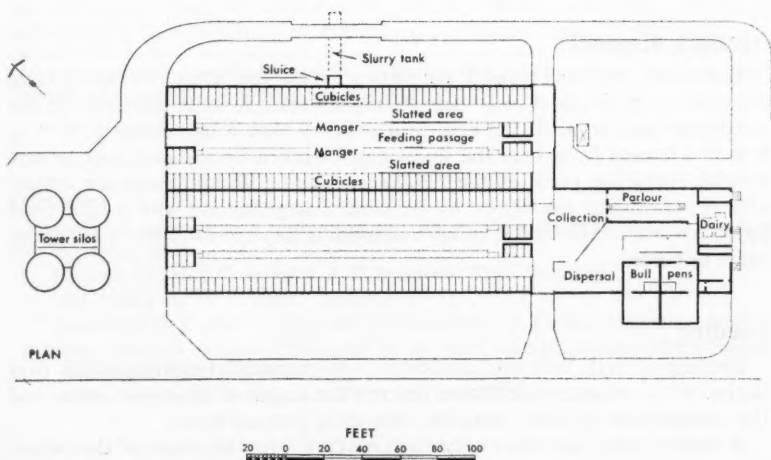
## How the job was done

Work was eventually started on a layout devised by the Hon. J. A. Davidson, the resident director, and the farm manager, Andrew Woodhead, in conjunction with Lt. Col. J. H. Tritton, director responsible for buildings, and his building staff. The prefabricated concrete framework, the milking parlour and dairy equipment, the four 350-ton capacity silage towers, slatted floors for the feed areas, cubicle partitions, feeding yokes and the electrical work were put out to contract. All the rest was done by the farm building staff, including walls, floors, drains and some excellent smithy work in fencing and gates of ingenious and original design.

## The design

Four rows of cubicles, each with its own slatted feed area which face, in pairs, on to two feedways, are contained within a twin-ridged concrete framed building 207 ft long and 110 ft wide. One 55 ft span frame is extended a further 77 ft to embrace two bull pens, covered collection and dispersal areas, a 12-unit 24-standing herringbone milking parlour, a dairy containing two bulk tanks with a total capacity of 900 gallons, and office and cloakroom accommodation for the cowmen.

At the other end of the main building a nest of four tower silos, each with a maximum capacity of 350 tons of high dry matter silage, rises to 60 feet from the ground.



## **Environmental control**

Considerable care was taken in the design of the ventilation system and the insulation of the building. Adjustable timber shutters are fitted beneath the eaves to provide controlled inlet ventilation and there is a continuous open ridge outlet. The double skinned corrugated asbestos roof has proved to give very effective protection against extremes of temperature. One morning last winter when the outside reading was 18°F (−8°C) the lowest temperature recorded in the building was 30°F (−1°C).

## **Cubicle comfort and the slatted floors**

The cubicles are basically of a conventional construction with pre-fabricated tubular divisions and with railway sleepers forming the floor and the heelstone. The original design has been modified considerably. It was very soon discovered that a length of 6 ft 9 in. was too short for the Strutt and Parker Friesians and so the heelstone was extended by 9 in. Recently the sleepers forming the floor of the cubicles have been taken out as it was felt that they were contributing towards injuries. These have been replaced with dried farmyard manure topped with sawdust. Although it is still early days to judge the success of this alteration, the cows certainly seem to find it more comfortable, and by their natural action in lying down they push some of the bedding up under the cubicle divisions, thus forming a bolster between each cubicle.

Reluctance to use the cubicles is rare. Some five perverse old cows who doggedly refused the comfort of the cubicles and preferred to lie muckily on the slats were moved to other herds in the first few weeks. In the last two years, culling for this reason has not proved necessary. The high incidence of cubicle use is attributed largely to the lack of a comfortable alternative; the average cow does not regard the slatted floor as a suitable bed. As a standing, however, the slats appear to be perfectly acceptable and, though a film of dung makes them on occasion a little slippery, no solid material remains on the surface.

## **Manure disposal**

The slurry channels beneath the slats are three feet deep and have a total capacity of 25,000 cu. ft or storage for eight weeks. A sluice gate outside the north-east wall controls the flow into a slurry tank approximately 40 ft × 6 ft × 6 ft, and from here the slurry can be taken by vacuum tank to any suitable spreading point on the 2,000-acre holding. If conditions are unsuitable for spreading directly on to the land, a large lagoon with a hard road approach is available and is capable of holding any excess of slurry for many years to come.

## **Feeding**

Feeding of both bulk and concentrates is carried out entirely in the four slatted areas. Mangers with yoke ties run the length of these feed areas and the mangers are charged from the two main passage ways.

A high protein silage feed after each milking forms the basis of the ration. This is delivered to the mangers from the feedway by an automatic feed box

of two-ton capacity mounted on an electric float chassis. The whole herd can be fed in fifteen minutes, noiselessly and without the unpleasant fumes associated with a fuel-powered truck.

Concentrates are fed before milking directly into the mangers from a hand trolley. Each cow receives a starch balancer ration of barley, sugar beet pulp and oats with added minerals and vitamins. Cows giving over two gallons of milk a day are fed a proprietary dairy nut.

### **Management and the milking routine**

The herdsman, who is also the senior hand and responsible for the daily management of the herd, feeds the cows without assistance. He does not milk but is responsible for the weekly recording and so is able to adjust individual rations according to yield, without the distraction of a milking routine.

The two cowmen are, for their part, free to confine their efforts to the routine of milking and are thus able to handle six milking units each. A boy, who acts as odd job man and relief milker, completes the dairy staff.

Mr. Davidson claims that this labour system allows the herdsman to see his cows and use his management skills to their best advantage. In addition, greater accuracy in dispensing the concentrate ration is possible and a simpler routine makes relief milking less of a problem. A considerable saving in first costs was also achieved by eliminating the need for automatic parlour feeding.

### **Capital costs**

The capital costs were high. The gross expenditure on the complete unit, including forage towers, cubicle house, feed yards, slatted floors and a fully equipped milking parlour amounted to just under £61,000. Farm Improvement Scheme grant reduced this figure to a net cost of about £45,000. But the herd is now handled by a labour force of four, including relief, and the steady improvement in milking performance suggests that the target production figure of 1,050 gallons of milk sold per cow will be achieved within the next full financial year. The budget is based on a milk yield of 1,050 gallons over ten years, allowing for increases in labour, feedingstuffs, etc., which is calculated to show a return of 26 per cent on the net capital investment.

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This article has been contributed by **I. B. Mathieson, Q.A.L.A.S.**, a Senior Assistant Land Commissioner for the Agricultural Land Service in Essex.

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- 'A 500-cow Dairy Unit in Sussex' by N. K. Green (October, 1968)

The author, R. P. Charlesworth of the Marketing Development Department of the N.F.U., discusses the trends in marketing and co-operation of pigs.



## Pig Marketing and the Future

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WE can breed pigs, house pigs and feed pigs to a high degree of efficiency, but we fall down so often on marketing. The last five years has seen the birth of a revolution in our industry.

1. Pig Industry Development Authority has been used sensibly, and has led to production efficiency.
2. Co-operation is no longer a dirty word, and has made great advances.
3. Government grant-aid has been extended through the Central Council for Agricultural and Horticultural Co-operation.
4. The increasing demand for quality has forged a stronger link between production and marketing.

In the context of production linked with marketing, let us examine some groups in action and see what the future holds for them.

Weaner marketing groups have been with us for a long time now and in the main have been successful. They have demonstrated the advantages of co-operation by levelling out the notorious price fluctuations experienced in the open market, and they have been able to improve the quality of the weaner pig through earmarking, recording and pass-back of carcase details and by simple visual assessment and rejection at time of collection. To encourage improvement, certain feeders are prepared to award something extra, say 2s. 6d. per weaner, for those pigs sired by a high-pointed boar, whilst groups are able to supply selected breeding stock to their members on a contractual basis. In the future, a possible trend will emerge whereby the weaner producer becomes far more of a 'specialist', using what could be classed as a 'flying herd' and contracted to a breeding company or its multiplier for his breeding stock which he would replace every three years on a one-third per year basis. He will be a member of a group which will offer him long-term contracts for weaners of a specified quality and he will receive advice and performance figures from a Field Officer employed either by the group or jointly by a number of groups. A system would be preferred whereby the weaner producer is rewarded for a quality pig at the time when it will have the greatest impact on his planning—at the time of weaner

collection—not as a grading bonus at the end of the feeding period. However, it is appreciated that this is difficult in practice. Consider that an average weaner commands the same price, in most cases, as the Premium weaner, and yet at say 7½ score dead weight we find:

	£	s.	d.
Grade 1 @ 52s. 6d.	19	13	9
Grade F @ 41s.	15	7	6
Difference	4	6	3

As weaner groups become increasingly quality conscious in the future they will be wanting rewards. They have reached the end of their basic education programme now and are looking ahead. We may well see a number of central breeding or feeding units springing up in the next few years, and there are quite a number which are being planned at the moment which will have outputs of 8–12,000 finished pigs each year, and these are being considered with a quality end-product very much in mind.

There is a lot of activity amongst the integrated weaner and feeder groups at present. These have stood the test of time as marketing groups and are now well-established on the scene. Basically, such groups have a certain number of weaner producers and a certain number of feeders. The group administers the transfer of weaners and also arranges contractual marketing at the end of it all. Many of these groups extend their services to calves, store cattle and lambs. One example of an integrated group which is very successful is Porcofram which operates in the Eastern Counties. Currently, it has 94 members and markets over 70,000 pigs a year. They are basically a heavy hog-producing group and get their replacement stock direct from the breeding scheme run by Messrs. T. Walls and Son. They have gone into group milling and mixing for their members and sell three standard rations amounting to 600 tons/month, and over 80 per cent of all the pigs they handle are fed on Porcofram rations. This eases the transfer of pigs from weaner producer to feeder. The price for this feed is fixed on the cost of the raw materials plus an agreed profit margin for the miller. The group collects 2s. per pig from the weaner producer and a further 2s. per pig from the feeder to cover the costs of administering the scheme. Financial benefits at the end of the day amount to 2s. per weaner, 5s. per porker, 7s. per baconer and 21s. per heavy hog, taking into account the savings on foods, transport, marketing procurement fees and payments for level deliveries.

Another type of a farmer-controlled integrated group is in the form of a central feeding unit owned, for example, by a group of weaner producers. The parent body purchases the weaners for its members, houses them in the central unit, feeds, records and finally markets the finished pig. This type of development is on the increase and a number of such projects are being studied at present under a feasibility grant from the Central Council for Agricultural and Horticultural Co-operation. Such schemes have numerous advantages:

1. Proper use of records turns such a unit into a progeny-testing station and is a valuable tool for selection and improvement.
2. With the right class of raw materials and with good management, it is possible to get a fair return on capital, provided that one has not erected a pig palace!
3. They show their value in times of glut in weaner production and when the cost of transporting weaners many miles to a feeding area is becoming prohibitive.



However, they do require a lot of capital and a lot of careful planning.

In the future, integrated groups will have to examine their position with care and see what the next step in their development should be. This could well be a central unit of one sort or another—possibly a multiplying or testing unit. It could well be localized milling and mixing or a scheme for contractual purchase of feeds. They will certainly be looking more closely at marketing either as individual groups or as a group of groups. Here we could well see local brand images appearing and more highly specialized quality marketing outlets being supplied, but it is absolutely essential that groups should study the practicabilities of these developments in great detail, bearing in mind the nature of the meat trade, and the return on capital invested. Some very interesting schemes, however, are in the melting pot and certain groups deserve high praise for their foresight.

There are few groups exclusively set up to market the finished pig as their sole function. The majority of such pigs are marketed by groups as part of an overall service. The larger co-operatives sometimes act as procurement agents for local bacon factories. A number of feed firms also supply this service tied in contractually to the use of their feedingstuffs and channelling the pigs to a certain factory. This is a difficult field for crystal-gazing as far as the future is concerned. More quality pigs are needed by the trade, and these must be home-produced. Full marks to the £300,000 publicity scheme launched in October by the British Bacon Curers' Federation (which represents 150 individual firms) to tell the housewife about 'British bacon'. Other firms have transformed the heavy hog into a bacon pig by developing the vacuum packed bacon business. This now forms ten per cent of the domestic rashed bacon market. The thoughts behind this development were:

1. Growth of supermarket sales.
2. Shortage of skilled staff to bone and slice sides in the shops.
3. Increase in the numbers of married women who go out to work and consequently have less time to shop.

The tightening-up of the top grade in the bacon industry in June, 1968, has yielded better quality carcasses in the top selection and has put an even greater emphasis on quality in this sector of our pig industry.

More quality means better breeding stock which has been selected for economical lean meat production. This demand has seen the birth of further co-operation by farmers to fulfil a requirement. Pig breeding companies are well established now. Provided that all are selecting for the same things, and I think they are, this must lead to more standardization in our finished pig. There are also a number of breeding companies financed by feed firms, meat wholesalers and other non-farming interests which produce a selected pig to suit the quality market. These are sometimes tied in with credit and feeds which may or may not be a good thing.

Vertical integration is not necessarily a bad thing in principle, provided that farmers control the integration and will be able to do so in the future.

As a direct result of co-operation between producers and a bacon factory in recording and liaison, a 'split sex' contract was established in April, 1967. The decision to introduce this contract was made after studying the following grading percentages which were extracted from all contract pigs slaughtered at the factory during the previous year:

Bacon-weight pigs	Gilts	Hogs
	%	%
1 A	56	11
1 B	6	10
2	35	57
3	3	12

It was found that hog pigs marketed at approximately one score lighter than previously, i.e., around 6 score 10 lb dead weight, graded considerably better and thus gave a better return to the producer and provided a more useful pig for their factory. The remarkable improvement in quality grading obtained by operating this 'split sex' three grade contract is shown in the following percentages after the end of the first quarter of the company's current contract:

Grade	Gilts	Hogs
	%	%
Q	71	43
2	21	40
3	8	17

Incorporated in this bacon/cutter contract is a top price of 53s. 3d. per score for a 'special Q' grade, for a pig killing out between 135-145 lb dead weight, and having a minimum length of 780 mm, a 'C' probe of 22 mm maximum, and maximum backfat measurements of 26 mm at loin and 46 mm at shoulder. This contract has been continued this year with slight variations in prices etc. There should be more of this sort of development in the future.

The word 'group' covers a multitude of ideas and empires; many are successful and here to stay; a few, however, are on their way out. Why do some fail whilst others succeed? So much depends on the attitude of the members to their group and its objectives. A large number of marketing schemes and indeed those linked with production will, in the future, be planned with grant-aid in mind. The Central Council for Agricultural and Horticultural Co-operation, which was set up in 1967, encourages a thorough examination of the feasibility of any project submitted to them and is prepared to grant-aid three-quarters of the cost of such a study in approved cases. This is vital to any scheme and we will see far fewer failures as a result. Subject to the eligibility and nature of the final proposal, further grants might subsequently be available of up to one-third for buildings, fixed equipment, working capital, managerial salaries and expenses. Formation costs of new co-operatives can attract 75 per cent, as can training of managers and research.

Marketing is becoming highly specialized and the average farmer has little time or inclination to go too deeply into this complex subject. This is where managers and advisers of groups and co-operatives have a big part to play in keeping a watchful eye on market trends and prices. Excellent economic and technical reports are available to groups from such bodies as the Meat and Livestock Commission and, used in conjunction with prices in the weekly farming press, give groups and farmers a good basis from which to work. Representatives of groups and co-operatives are able to meet at regular intervals under the auspices of A.L.P.M.O. (Association of Livestock Producers' Marketing Organisations) to discuss regional, inter-regional and national trends in marketing. All part of this business of marketing: you can go it alone, or you can get together.

# Producer Associations in France



R. C. Rickard

FROM 1960 to 1964, the French Government introduced into its farm policy three agrarian laws which laid the foundation for improving the structure of its agricultural marketing. The aims of the new policy decisions were to adapt the marketing of agricultural products to changing methods of distribution and processing, and to introduce a measure of price stabilization on those markets which were considered to be inadequately protected by the state market regulation systems. Their objectives were to be achieved through control of production by producer organizations in order to obtain a form of price guarantee, and through market stabilization funds contributed by the members. In addition, long-term contracts would be negotiated and these would operate not merely between individual undertakings but also at a regional or national level between the branches of the trade concerned. By these means 'groupements' or producer associations would play an important part in the improvements needed in agricultural marketing.

A producer association receives considerable financial assistance for its initial setting up and for its operation in the early years. To qualify for such assistance it must meet certain stringent requirements. For instance, it is stipulated that there should be a minimum level of production by the association, compliance with prescribed quality standards and delivery conditions, and marketing of the whole of members' production of the particular commodity through the association.

The regulations relating to a minimum level of production are strictly enforced. Such minimum figures as, for example, 300 hectares of vegetables or 8,000 pigs marketed in a year mean that in some areas up to 100 members are needed in one association. It seems, therefore, that the intention in France is to set up effective marketing organizations despite the danger that high qualifying figures of production may at first retard the pace at which these associations are set up.

Producer associations can be one of two types—those which confine their activities to production and those which do their own marketing as well. The role of the former is solely the standardization of production techniques and quality within the association. They cannot offer their production collectively on the market and delivery contracts are signed only by individual members. However, plans for the future are to make self-marketing associations the rule and, by mid-1966, 70 per cent of French producer associations belonged to this type.

### **Co-operatives and producer associations**

The setting up of producer associations in France may be regarded as a logical extension of the agricultural co-operative societies. A major weakness of the traditional agricultural sales societies is that, because of a lack of loyalty on the part of members, they are not in a position to build up a marketing power commensurate with the size of their membership. This shortcoming is eliminated when the co-operative becomes a 'groupement' which can pledge its members to the delivery of all their production of a particular commodity.

A further weakness of the co-operatives lies in the rigidity of the legal provisions relating to their business conduct; they are bound by law to do business exclusively with their members. This weakness has been very largely eliminated by the formation of the 'Sociétés d'intérêt collectif agricole' (SICA) which were given legal status in 1961. The SICA occupies an intermediate position between companies in ordinary law and the agricultural co-operatives, and provides the co-operatives with the means of extending their activities beyond the previous statutory limits. The objects of a SICA are to set up and manage installations or equipment, and to render services to farmers or to a certain district. A SICA may, under certain conditions, admit non-farmers as members and transact up to half its business with persons other than its members. For example, storage and packing facilities can be shared with non-members and this sharing ensures that expensive assets can be employed more fully, with resultant lower costs. Many of the existing co-operatives in France have set up complementary SICA organizations in order to have greater freedom of commercial action with the added advantage of being recognized as producer associations.

In some sectors of French agriculture, the co-operatives have become powerful and have exercised an important market-stabilizing function. In the mid-sixties, 800 co-operatives accounted for over 80 per cent of all the wheat stored and 65 per cent of all coarse grains; approximately 3,200 dairy co-operatives, comprising some 350,000 producers, marketed 52 per cent of the total dairy products. In other sectors, such as livestock and meat and fruit and vegetables, the activity of the co-operatives has been at a much lower level. It is in these sectors that greater attention has been given to the establishment of producer associations.

### **Fruit and vegetables**

The pace of development of producer associations in French horticulture, excluding potatoes, varies widely from one region to another. Greatest progress has been made in the more important growing areas. In some instances, a considerable proportion of regional production has come under

the control of the 'groupements' which have tended to combine into regional agrarian committees.

In Aquitaine, recent figures indicate that about half the production of dessert apples, and in mid-Pyrénées almost a third of it, are controlled by producer associations or a combination of them. In Burgundy, however, the proportion is under one per cent. Virtually all the cauliflower and artichoke production in Brittany, which accounts for about half the total French production, is under the control of the agrarian committee. There the SICA of Saint-Pol-de-Léon occupies a dominant position, with its control of supplies and a price-pegging system financed by a levy on producer's sales.

Long-term contracts between producers and the trade are rare. Until now, most of the producer associations have sold their produce freely to individual buyers, with the exception of the SICA of Saint-Pol-de-Léon and the producer association in Nantes which sell their produce under contract to the trade.

It is intended that the producer associations should ultimately finance their trading operations and price-support schemes from their own funds, raised from members' contributions. However, in order to surmount any initial difficulties, the French Government grants low interest loans to recognized producer associations for a period of two to three years after the commencement of operations. These loans are conditional upon the association or the agrarian committee gaining a major share of the production of a commodity in an area by the third year of operation. In addition, loans and grants are available for capital investment.

### **Livestock and meat**

In the beef sector the original idea was to encourage specialist beef production but this was found difficult because in France there is no specialized beef or dairy production. Consequently 'groupements' which undertake both activities can now be recognized. At present, only a very small part of the national beef production has come under the control of producer associations.

In the pig sector, however, progress has been slightly more rapid, probably because the minimum qualification figures can be reached more easily. Moreover, the initiative to set up 'groupements' come not only from the pig producers themselves but also from the supply co-operatives. These latter can take on the business of marketing store pigs for further fattening and also provide feedingstuffs to members of the groupement who also belong to the co-operative. In 1966, it was estimated that about twenty producer associations were at work, almost all of them in the major pig-producing areas. Their size is not known but estimates have put their share of French pig production at no more than three per cent.

Financial assistance to associations of French livestock producers is available in several forms. First, there is a development subsidy amounting to a part of the increase in capital required when a 'groupement' is formed within an existing co-operative. Second, there is assistance towards the maintenance of guaranteed prices to encourage the supply of store animals by contracts. Third, aid is available to cover part of the operating costs of a producer association during the first three years of its operation.

To sum up, the livestock and meat sector constitutes one of the greatest problems in the reform of agricultural marketing in France. The small-scale French livestock industry is ill-equipped, in terms of both quantity and



quality, to meet the wider and more competitive demands of a Community market. Added to this is the system of centrally-orientated price quotations around the Paris market and the absence of regional meat markets with the appropriate slaughtering capacity. There are thus two crucial aspects in the future of meat marketing in France. In the first place, there should be a much greater degree of concentration and co-operation in production. The French producer associations have recognized this responsibility and are endeavouring to re-align production with financial assistance from the State. The second consideration is the formation of a modern marketing network. Towards this end, a national plan for slaughter houses has been drawn up according to which all regions should be provided with an adequate slaughtering capacity. A pre-requisite for this must be an even and continuous supply of livestock to the market. It can best be achieved, according to the ideas of French agricultural policy, through producer associations and by contracts between producers and the meat trade.

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## **The Slurry Problem on the Farm**

**Henry J. Hooper**

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THE collection of farmyard manure, slurry, silage effluent, storm water and any other waste on the farm needs very careful consideration. Greater concentration of stock on farms these days increases the difficulties. Statutory requirements have to be considered, which are governed by the Public Health Act of 1961, the Rivers (Prevention of Pollution) Act 1961 and the Water Resources Act 1963.

General drainage on the farm falls into the following categories:

1. Drainage from the farm dwelling-house(s).
2. Surface and roof water (storm water).
3. Silage effluent.
4. Drainage of a liquid type from livestock buildings including milking parlours.
5. Farmyard manure and slurry.

When thinking in terms of the slurry problem on the farm it is as well to bear in mind that it is by no means the only drainage problem to be dealt with, although this may be a major problem and an expensive one to control.

## **Drainage from the farm dwelling**

This may go to a public sewer otherwise a septic tank with filter bed is required. The resultant effluent from a filter bed which is functioning correctly should be pure enough to discharge into a watercourse. A filter bed may, however, discharge into a field pipe system and then into a brook, ditch etc.

## **Surface and roof water (storm water)**

Rainwater falling on to open paved areas of concrete upon which cattle stand is considered to be polluted and as such cannot be passed into the storm drains. This also applies to drainage water from a milking parlour. Water taken directly from roofs and non-polluted areas can be led through storm drains and discharged direct into a watercourse.

## **Silage effluent**

Careful attention when making silage will keep effluent down to a minimum. This effluent will cause fungus growth in pipes so that any drainage should be led through open channels and pass through a bituminous protected tank for ultimate disposal on the land. Where subsoils are very permeable, soakaways can be used provided percolation will not affect water supplies, drains and watercourses.

## **Drainage of a liquid type from livestock buildings**

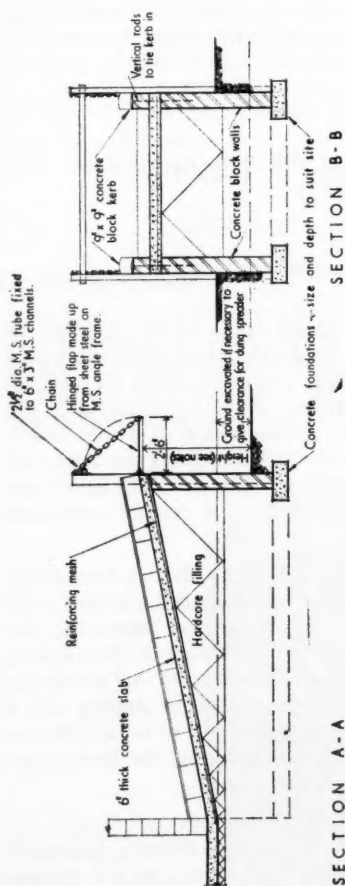
Urine has valuable manurial properties and may be collected separately to a settling and storage tank of sufficient capacity. This will be determined by the daily amount and storage period required.

Other liquid manure, which may include waste water from the parlour, can be piped to a liquid manure tank of a capacity dependent on the stock kept. Disposal may be permitted by means of a field drainage system provided the subsoil is sufficiently permeable and no risks of pollution are present. Failing this the tank will need to be emptied and the contents spread on the land.

Typical capacity sizes of liquid manure tanks are as follows, using a standard width of 6 feet and an effective liquid depth of 5 feet.

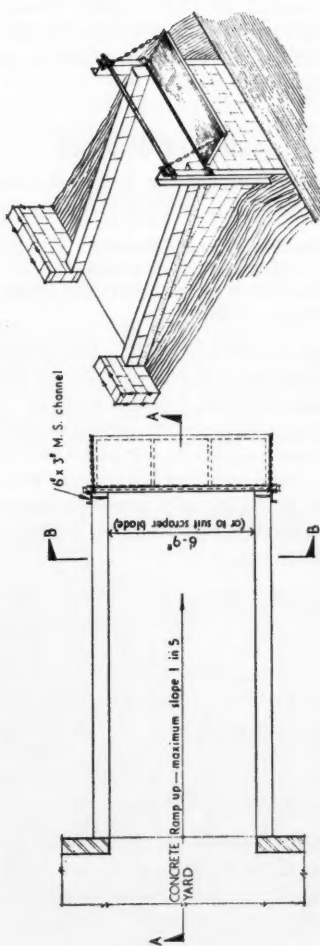
Internal length of tank	Capacity in gallons
8 ft	1,500
10 ft 8 in.	2,000
13 ft 4 in.	2,500
16 ft	3,000
24 ft	4,500
26 ft 8 in.	5,000

This then deals, broadly speaking, with the general aspects of drainage in and around the farm buildings other than considering what can be done with the farmyard manure and slurry. One is well advised to draw up a detailed plan of the gullies, manholes, tanks, etc., in the farm buildings area, as this will help with efficient control of the drainage system and will also assist when additional drains have to be built.



This drawing is intended for advisory purposes and general guidance and may need modification to suit particular sites. Where height of ramp is more than 5 ft, safety requirements should be observed.

# SCALES



ISOMETRIC VIEW  
Slurry disposal ramp

## Farmyard manure and slurry

The increase in numbers of livestock on the farm and a decrease in the use of strawed yards has resulted in a need to handle manure in both liquid and semi-liquid forms. This in turn has brought with it new problems of mechanization, building design and layout in which consideration must be given to the following aspects of the slurry problem:

1. How to handle the material.
2. How and where to store it.
3. How to dispose of it.
4. How not to cause nuisance to other people and to avoid pollution of watercourses.

## Disposal methods of limited use

Few farms are able to discharge into a public sewer. In any case, costs for doing so will probably be very high. True oxidation ponds and lagoons are not successful in this country because temperature conditions are not favourable and there is always a danger of odour complaints. Thermal drying is technically possible but unlikely to be financially viable for anything except poultry manure.

## Practical system of disposal

Basically there are four methods of dealing with the manure problem when the manure is to be applied direct to the land:

1. Handling as a solid manure.
2. Handling as a semi-solid manure.
3. Handling as a liquid slurry and spread by tanker.
4. Organic irrigation.

*Handling as a solid manure.* The liquid manure needs to be absorbed by bedding and it will help if most of it can be drained and piped away to a liquid manure tank. For example, in a cubicle shed or feed area the concrete floors may slope in one direction thus leading off the liquid manure. The remaining dung can be scraped away in the opposite direction. The mechanical equipment required is a tractor with scraper scraping direct into a manure spreader by means of a ramp, or loading with a fore-loader. On light lands little storage space is required, whilst on heavier lands, a manure compound will be required.

*Handling as a semi-solid manure.* This varies from the first system either due to the omission of bedding material or the use of limited amounts only. In addition, the liquid manure is probably not drained off separately. The state of the resultant slurry can vary enormously according to the amounts of bedding and urine present. Equipment required is similar to that previously mentioned, but the manure spreader needs to be capable of dealing with a firm slurry. Very often scraping will be either to a ramp, for direct application to the land, or to the storage area when the condition of the land is not favourable for wheeled vehicles.

*Handling as a liquid slurry spread by tanker.* Water may be mixed with the dung and urine in order to give a 1 : 1 ratio of water to manure, because it is necessary to provide the correct consistency for handling by the vacuum tanker. The equipment will consist of a tractor, tractor scraper and mobile tanker. In addition, a special slurry container will be required in the form of

a tank below or above ground, possibly with a slurry auger or manure pump to agitate the slurry and load the tanker.

**Organic irrigation.** This system is based on hydraulic handling. The solid and liquid manure are together diluted to give a mixture of one part manure and two parts water. This mixture has to be agitated before being pumped through pipelines and distributed by rain guns. The pipelines can be partly permanent and partly movable and this will generally be decided by the layout of the land.

### Calculation of quantities

The method of housing and cleaning adopted has a direct bearing on the calculations of slurry. For dairy cattle a basic figure of 15–20 gallons per cow per day (according to amount of washing water) can be taken. For a 60-dairy cow herd, the daily slurry output will be 1,200 gallons. Assume a ten-day storage period and this will mean a tank with an effective capacity of 12,000 gallons. This could be stored above or below ground level. A rectangular tank would require effective sizes of say 10 ft deep by 10 ft wide and 20 ft long. This is based on the higher 20 gallons per cow per day figure and can, therefore, be reduced in size if the added liquids are less or they are disposed of elsewhere. Circular above-ground tanks of similar capacities would be as follows:

Diameter	Height	Gallons capacity
14 ft 9 in.	11 ft 6 in.	12,000
22 ft	5 ft 10 in.	13,350

### Choice of system

The type of land is often a controlling factor. On light land a more solid form of manure or slurry can be made and pushed direct into a manure spreader and carted on to the land, and as a result the costs of the operation are kept to a minimum. On a wet farm wheeled transport will be unable to operate throughout the winter and a choice will lie between all-winter storage

*A rear-mounted scraper is used to clean the cubicle house passageways and load a waiting trailer*



and a form of organic irrigation. Between these extremes some occasional spreading may be possible during the winter months, but partial winter storage will still need to be catered for.

## Costs

The cost factor has two main aspects:

1. The initial capital outlay of mechanical equipment and building works.
2. The running costs, especially labour.

Workable systems related to a particular farm need to be carefully costed before a particular system is finally adopted.

River pollution, nuisance to neighbours and possible health hazards have to be considered. Contamination of watercourses, or proximity of houses and recreation areas might eliminate the use of organic irrigation.

## General data

Further figures that will help as a guide for initial planning can be extracted from the literature mentioned below: For example—amount of dung produced per beast per day; storage capacities of slurry tanks; gradients and safety factors of ramps; guide to costs, etc.

This article has been contributed by **H. J. Hooper, Q.A.L.A.S.**, a Senior Assistant Land Commissioner with the Agricultural Land Service in the South-Eastern Region.

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No. 44. *Slurry Handling*  
No. 67. *Farm Waste Disposal*  
Fixed Equipment of the Farm Leaflet No. 21. *Drainage of the Farm Homestead*. price 3s. 0d. (by post 3s. 4d.) from H.M.S.O. addresses on p. 356.
4. Cement and Concrete Association, 52 Grosvenor Gardens, London, S.W.1. *A Concrete Slatted Floor for Cattle*. (free issue).

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### Advisory Drawing No. 4 D.1.

Copies of the drawing of the slurry ramp that is shown on page 329 are available, free of charge, from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex.



# Efficiency in Pig Buildings

E. R. Butler

*'This system is working all right; why should I change it?'*

*'Goodness, man, we've been doing this for years.'*

Have you heard these words before? Do you know somebody who has said them? I expect so.

Many systems of housing pigs and of working in the buildings have been devised. Some work better than others. But time does not stand still. New ideas are floated, profit margins alter. There is much talk of conversion ratios and scientifically blended rations. The means—the effort of man—by which those results are achieved is often overlooked.

An interesting illustration of change is contained in an article by Professor D. K. Britton, 'Future Pattern of Farming', which appeared in the *OECD Agricultural Review* 1968 No. 4.

Below is an extract from his Table on page 120 of the Review.

Table 1

Changing size of enterprise in England and Wales  
(Expressed in thousands)

	1954	1961	1963	1966
<i>Pigs</i>				
Keepers	182	110	103	83
Pigs	4,845	4,579	5,230	5,776
Pigs per keeper	27	42	51	70

This does not mean that one man to 70 pigs is the optimum herd size. In fact, a recent A.L.S. case study has indicated that one man to 150 sows and litters is not wishful thinking.

Although it is recognized that the cost of labour is usually only a small part of total costs, significant savings can still be made. Often it is found that excessive effort goes hand in hand with excessive use of materials (ill-measured rations, tractor idle time, etc.). An indication of the effect of different rates of feeding is given in the following table taken from *The Farm as a Business* No. 4. *Aids to Management—PIGS.*

Table 2

Effect of the quantity of food per sow per year on the  
profitability of weaner production  
(15 weaners per year)

Cwt of food per sow	20	24	28	32	36
<i>Output</i>	£ s.	£ s.	£ s.	£ s.	£ s.
Assumed value of weaner	5 7	5 7	5 7	5 7	5 7
<i>Costs</i>					
Sow food per weaner (31s. per cwt)	2 2	2 10	2 18	3 3	3 14
Remainder of costs (a)	2 3	2 3	2 3	2 3	2 3
Total	4 5	4 13	5 1	5 6	5 17
Estimated margin per weaner	(+) 1 2	(+) 14	(+) 6	(+) 1	(-) 10

(a) Creep feed, labour and other costs, stock depreciation.

The difficulty of running a pig enterprise at a profit is indicated in figures from the Cambridge University Pig Management Scheme (1966). One-third of the breeding herds in the scheme had a cost per weaner above the £5 7s. value assumed in Table 2.

But not only direct saving should be considered. Working conditions can affect a man's attitude to his job. 'Bad workmen always blame their tools', may be true—but bad tools can affect the standard of performance. Think about driving a battered, ill-maintained car and one properly serviced to do its job. Which would be your choice?

A pigman can expect to spend about 80 per cent of his time feeding and cleaning out. But the number of pigs with which he can cope will vary considerably. It will depend upon how his work is organized, the system of management, the equipment provided and the incentive to work.

Looking at the broad canvas, it is advantageous for a pig enterprise to be equipped with a standard type of building. This will give continuity of work, a similar daily routine. Equipment suitable for one building will be suitable for others. This cannot be said of a mixed bag of buildings. Quite recently a case study illustrated this. A new and different type of pig house had just been erected and a feed barrow of the same size as used elsewhere on the holding had been purchased. But it would not go down the passageways. A standard type of building will also help in persuading workers to put equipment back in the same place after use. It becomes automatic for a brush or shovel to be placed at X, for the feed barrow to be at Y. With an assortment of buildings there is more inclination to put things anywhere that is handy.

Having made sure that the feed barrow or other equipment can pass through the main doors and along passageways two further points need considering. Passages with dead ends mean backtracking—double travel without benefit. Corners have to be turned. Can the equipment easily negotiate them? Yet another simple question, but it frequently appears that in the grand design

little points such as these are overlooked and they ruin the system. Many times and in many places has it been said that the building should be made to fit the work routines and not the other way about.

With a piped water supply now available in most places it is amazing the number of cases that have been found of water being carried in buckets. Pipes can carry water far more quickly and save the effort of a man. In a Danish piggery 100 ft long a man would walk over 350 yards and take over 15 minutes to deliver only one bucket of water to each of 20 pens.

Assuming this job is done twice every day (and in only one house) this means that in a year the man would walk a minimum of 145 miles and spend 180 hours that could have been devoted to tending extra stock. The following table, which appears in the Ministry's Bulletin 172, *Planning Farm Work*, gives indications of time taken looking after fattening pigs.

**Table 3**

Fattening Pigs: Estimated labour use  
(Minutes per head per week—8 weeks to maturity)

Type of Housing	Danish		Harper Adams		Pen and run		Yard		Boxes
	<i>Average Good</i>		<i>Average Good</i>		<i>Average Good</i>		<i>Average Good</i>		<i>Average</i>
Feed	6.5	2.0	6.5	2.0	7.8	3.7	5.7	2.5	8.7
Clean and Litter	4.8	3.3	4.2	2.1	7.0	4.4	1.8	0.5	6.5
Other work	3.3	3.3	2.8	2.8	2.7	2.7	3.4	3.4	2.7
Total	14.6	8.6	13.5	6.9	17.5	10.8	10.9	6.4	17.9

Now let us take this example a stage further:

Allowing for 20 weeks in an average Danish piggery it takes 5 hours to look after one pig. This means another 36 pigs per year could be kept. And if the performance was good then it could be another 60 pigs. Is it worth carrying buckets of water?

There are many alternatives to carrying water. Drinking bowls, nipple dunks, small header tanks on pen division walls. Or in pens with horizontal bar fronts the bottom bar can be perforated to allow water to flow directly into the trough.

The feeding routine also provides much scope for thought. There are fully automatic systems available—at a price. But for one reason or another not everybody wants them. It is clear that the less the food is handled before consumption the lower the labour requirement. Bulk delivery to *ad lib.* feed hoppers is a possibility. This could then mean that the routine need be carried out only once every three or four days. But many pig keepers require measured quantities of food to be given. Theoretical requirement and actual practice differ in some instances. At one farm it was said to be very necessary that accurate rations should be fed. The spring balance had a dial graduated up to 50 lb. This meant that the space between 1 lb marks was only  $\frac{1}{8}$  in. The rations were noted to the nearest half-pound—in theory. But the balance had a ten per cent error to start with and lighting in the piggeries was not

bright. A mis-reading by only 1 lb gave a further error of about 7 per cent, a total error of 17 per cent. In light that is intentionally dull, accurate readings from minutely graduated scales are very difficult. A volumetric scoop can be accurate, and it cuts out the operation of weighing. If weighing of food is absolutely essential than make sure that the dial of the scale is easily read.

Cleaning out pens can create problems. In some designs it would appear that those who are to do the job must be midgets. In others the man is expected to be a high-hurdler. Easy access is most important. It saves time and temper and cuts down the risk of the worker injuring himself. A recent case study on a farrowing house basically of the Danish piggery type brought up two small points about brooms and shovels. It was noted that the worker had difficulty handling the broom in the confined space in the pens. By reducing the length of handle by 8 in. the task became much easier. It was also noticed that in shovelling soiled material out of the pens and into a barrow over 10 per cent fell on the passage floor. This meant an extra operation to clear up the mess. By lengthening the handle of the shovel the worker could easily deposit the load fully in the barrow. It was also suggested that a lighter shovel of aluminium instead of steel, would make for easier work.

The following table taken from Bulletin 172 for estimated labour usage for fattening pigs gives similar information for sows and litters.

Table 4

Estimated labour use  
Minutes per sow per week

	Danish type farrowing house		Pen and run		Fold and tether		Boxes	Dry sows on grass
	<i>Average Good</i>		<i>Average Good</i>		<i>Average Good</i>		<i>Average</i>	<i>Average</i>
Feeding	34	18	40	29	58	25	43	12
Cleaning	34	26	35	18	7	3	32	3
Other work	15	15	18	18	22	22	17	1
Total	83	59	93	65	87	50	92	16

Even the good performance listed for the Danish type house can be surpassed. A recent study shows that one man fed 30 sows in 10 minutes (i.e., under 5 min per week each). Now this performance is rather high and one would not expect everybody to achieve it, let alone maintain it day after day. However, with a well organized system it should be possible to reduce, by 35 per cent, the 'good time' given in the table.

There is always a better way. Given the right tools, a good routine and the proper motivation, many men could probably increase their productivity by at least 20 per cent. But always remember the man. If you could not or would not do the job yourself every day then do not expect others to do it.

The Agricultural Land Service has officers trained in techniques that could help provide better ways of doing jobs in and around farm buildings.

Requests for advice should be made to the Divisional Land Commissioner at the nearest Divisional Office of the Ministry.

This article has been contributed by **E. R. Butler, A.A.I.**, who is a Senior Assistant Land Commissioner with the Agricultural Land Service in London.

#### References

*O.F.C.D. Agricultural Review*, No. 4, 1968, price 5s. 6d. (by post 6s.)

*The Farm as a Business*, No. 4. *Aids to Management*, Pigs. 1968, price 2s. 6d. (by post 3s.)

Bulletin 172, *Planning Farm Work*, price 7s. (by post 7s. 8d.)

Obtainable from Her Majesty's Stationery Office or through any bookseller, (addresses on p. 356).

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## The Ministry's Publications

Since the list published in the June, 1969, issue of *Agriculture* (p. 303), the following publications have been issued.

#### MAJOR PUBLICATION

Smallholdings organised on the basis of Centralized Services Rpt. Report and Accounts for the year 1967-68 submitted by The Land Settlement Association Limited. (New) 3s. 3d. by post 3s. 7d.

#### FREE ISSUES

##### ADVISORY LEAFLETS

- No. 93. Brucellosis (Bovine Contagious Abortion) (Revised)
- No. 115. Slugs and Snails (Revised)
- No. 187. Woolly Aphid (Revised)
- No. 224. Red Spider Mites on Glasshouse Crops (Revised)
- No. 377. The Pollination of Apples and Pears (Revised)
- No. 566. Dysentery in Bees (New)

##### SHORT TERM LEAFLETS

- No. 29. Choosing Selective Weed-killers for Annual Weeds in Root Crops and Kale (Revised)
- No. 87. Farm Waste Disposal Silage Effluent (New)
- No. 90. Potash on Grassland (New)

*The priced publication is obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex. Single copies of the free items are also obtainable from the same address.*

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### Agricultural and Food Statistics A Guide to Official Sources

This new booklet has been prepared by the Ministry of Agriculture, Fisheries and Food and is available from H.M. Stationery Office (addresses on page 356), price 12s. 6d. (by post 13s. 2d.).

It is becoming increasingly apparent that food science and scientific agriculture are tending to merge into one. The author, Magnus Pyke discusses

## Food Science, Nutrition and Agriculture

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AN important phase in the history of nutritional thinking is coming to an end and a new one is beginning. The phase that is ending can be described as the chemical approach to nutrition. This has been immensely productive. Starting with the work of Pelkelharing in Utrecht, (Pelkelharing, C. A., *Nederlandsch, Tijdschr. N. Geneesk*, 2, 3, 1905), Osborne and Mendel in the United States (Osborne, T. B. and Mendel, L. B., *Bull* 156, Carnegie Inst., Washington, 1911) Eijkman and Grijns in the East Indies (Eijkman, C. and Grijns, G., *Arch. Hygiene* 58, 150, 1896) and Hopkins in Cambridge, (Hopkins, F. G., *J. Physiol*, 44, 425, 1912) it was epitomized by McCollum as 'the newer knowledge of nutrition'. (McCollum, E. V. *The newer knowledge of nutrition* (Macmillan) New York 1918). From the foundation of the researches of these men and many others it became possible to assess the nutritional requirements of different types of individuals—of men engaged in different types of activity, of women, expectant mothers, infants, children of different ages and adolescents—in terms of the chemical composition of their diets, that is to say, in terms of protein, carbohydrate and fat, of mineral nutrients and of the numerous diverse trace components categorized as vitamins. With the later developments of more subtle methods of analysis, and notably of paper-partition chromatography, it became possible to analyse foods, and particularly the protein in food, with considerable precision, to assess nutritional requirement with remarkable specificity and, finally, to elucidate the biochemical function of individual nutrients in precise detail.

### Chemical approach

The knowledge acquired by this chemical approach to nutrition has made it possible to draw up tables of the nutritional requirements of different types of individuals. Among the first of these were the estimates made by an expert committee of the League of Nations in 1936, followed by a series of recommendations of the U.S. National Research Council, each based on increasingly precise data, as well as other assessments made by British,



Indian, Canadian and several other authorities. (Pyke, M., Proc. 6th Int. Congress Nutrition, (Livingstone), Edinburgh, 1964). These standards being available, it became possible to calculate the chemical composition of the diet eaten by an individual or of the food supply of a nation, and compare the result with the requirement of the same individual or of the community of diverse individuals comprising the nation and hence assess whether the diet was sufficient and, if it were not, in what respect it was lacking.

This chemical approach to nutrition was responsible for some dazzling achievements. Rickets, which occurs when calcium and particularly vitamin D are lacking in the diet, was at one time a scourge among young children growing up in northern industrial towns. Armed with the newer knowledge of nutrition, Chick and her colleagues (Chick, H. and Dalyell, E. J., Wien, Klin. Wschr. 32, 1219, 1919) demonstrated in Vienna in the winter of 1918 how the disease could be overcome. Nowadays, infant foods are commonly enriched with vitamin D. Lacking knowledge of the function of vitamin A, the public health authorities in the Netherlands (Bloch, C. E., Rigshosp. Børneafdeling Medd., 2, 1, 17; 3, 57, 1918) were in 1918 confronted with cases of xerophthalmia in young children. Nowadays, margarine is reinforced with vitamin A. Yet, potent though the chemical understanding of nutrition may be, it is insufficient to master all the problems of dietary adequacy.

Although one of the functions of food is to provide the diverse nutrients the consumer needs in the amounts he requires, this is not its sole purpose. People eat bread and meat, cheese and cabbage; they do not ingest calories and protein. When calculations suggested that the British wartime diet might at one stage be deficient in protein, dried salted cod was imported from Iceland. But the nutritional status of the British did not benefit; the dried salt cod was unpopular and remained uneaten. Similarly, when dried yeast was, with considerable trouble, grown on the surplus sugar in the wartime West Indies, the people there gained little protein from the trouble taken. They, too, did not like this special dietary supplement and declined to eat it.

### Nutritional progress

But besides the likes and dislikes for various foods, to which every community holds with considerable tenacity, the enlightened nutritionist who moves beyond the chemical approach to nutrition also recognizes another factor. This is the influence of wealth or, to invert the statement, of poverty on nutritional well-being. Although other students have done likewise, Seebohm Rowntree (Rowntree, B. S., *Poverty and Progress* (Longmans), London, 1941; Rowntree, B. S. and Lavers, G. R., *Poverty and the Welfare State* (Longmans), London, 1951) in his three classical studies carried out in the City of York in 1899, 1940 and 1950, showed most dramatically the relationship between nutritional well-being and income. Rowntree demonstrated in general terms that below an economic level, which he designated as the 'poverty line', it was not possible for people to obtain a nutritionally adequate diet. His studies were of the social system as a whole. Sir John Boyd Orr (as he then was) showed the same thing in terms of specific nutrients in his survey of working-class families throughout Great Britain. (Orr, J. B., *Food, Health and Income* (Macmillan), London, 1936).

Since these nutritional studies were done there has been a general and steady improvement. This has partly been due to the chemical enrichment

of bread with calcium, iron, niacin and thiamine (vitamin B<sub>1</sub>), to the addition of vitamins A and D to margarine, and to the provision of vitamin supplements and milk for children. Part of the advance must be attributed to economic prosperity and to the more equitable distribution of wealth. But part must also be credited to that section of the general advance in technology that has been devoted to food production and food processing. These three aspects of nutritional progress have been closely inter-related in the immediate past and will become even more so in the immediate future. Within the last generation, poultry husbandry, to take an obvious example, has been revolutionized. The advance of nutritional understanding, which has had so dramatic an effect on children's growth and well-being, has exerted equally striking results on the growth and development of chickens. By the use of appropriately selected pure-bred strains, and large-scale rearing techniques, together with the elaboration of continuous processing plants in which the birds are killed, mechanically plucked, dressed, chilled, wrapped in plastic film and frozen as high-quality standardized articles ready for marketing in an efficient modern supermarket, chicken has been converted from a comparatively expensive luxury article to a widely distributed and popular protein food.

The application of scientific principles to modern industrial technology has been the underlying factor responsible for the progress of the so-called 'developed' societies, of which our own is one. Lack of this same technological development is accepted as holding back similar progress in the developing nations. A hundred years ago, when an equally great advance in wealth from industrialization occurred, the diet of a substantial proportion of the population was deficient in vitamin A and thiamine, and that of the children in protein and vitamin D. The better diet today is due only partly to the supplementation of foods with chemical additives. Equally it arises from the application of the same principles of scientific technology, appropriately supported by nutritional knowledge, to food production itself. To cite another notable example, if peas were cultivated and harvested as they used to be and marketed in their pods, their contribution to the diversity of the national diet and to the desirable supply of vitamin C would be negligible. Instead, by the cultivation of selected strains of seed on suitable soil over a large area, the mechanized harvesting of the crop at the precise time at which analysis has proved that the tenderness of the peas and their sugar content are exactly right, followed immediately by freezing or dehydration, these are, in effect, direct contributions to nutrition, which as can now be seen, contributed more to health than a supplement of an isolated additive.

Cereal proteins are deficient in the essential amino acid, lysine. Lysine can be manufactured, just as most vitamins can, as a pure chemical compound. Alternatively, strains of maize specially produced by plant geneticists for the purpose can now be grown in which the protein contains higher concentrations of lysine. (Proc. high-lysine corn conf., Purdue U., Corn Refiners Assn. (Washington) 1966). Nutritional well-being can best be assured when a population can obtain nutritious foods to which its members are accustomed in appropriate variety. In our own technological society, in which we cannot afford to employ people in laborious hard work either in the fields or in the kitchen, the development of methods to cultivate carrots of uniform shape and length exactly to fit the type of can in which the canner intends to pack and process them, is also recognized by the enlightened nutritionist as a contribution to the dietary well-being of the community.

## Developments—food technology

The production of food crops, whether they be broilers, carrots grown to fit the cans they are to be packed in, raspberries specially bred to be 'picked' by machines (Lowe, D., *Adv. Sci.*, 25, 75, 1968) or bacon pigs, designed to give exactly the kind of rashers the customers want, are only part of food science. Equally important to the nutritional well-being of the citizens of an industrialized society in which mothers and daughters, themselves involved in economic employment, can no longer work at the preparation of their family's meals, are the developments of food technology. The modern diversity of frozen and dehydrated foods makes it possible for everyone to obtain a varied and nutritious diet to suit the kind of life that twentieth century social custom imposes. A recent paper published in the journal *Modern Hospital* (Berkman, J. and Moeln, C., *Modern Hospital*, 110, 92, 1968) describes in detail the increasing contribution made by purchased 'convenience' foods, and by such equipment as micro-wave ovens for preparing them, to the nutritional welfare of hospital patients now that cost makes it impossible to engage people to cook and prepare food in the conventional way. Likewise, the newly developed 'high-temperature-short-time' (HTST) method of stabilizing milk by the direct injection of live steam, (Burton, H., *Milchwiss*, 21, 18, 1966) so that a month's supply can be bought at a time, will represent a major contribution to nutrition when, as must inevitably occur, the milkman follows the kitchen maid into extinction.

## The future

For those who have eyes to see, it is becoming increasingly apparent that food science and scientific agriculture are moving in the same direction and are more and more tending to merge into one. The aim of the modern agriculturist is to produce high yields of nutritious food in a form specifically designed to meet the needs of the food technologist. But more than this, agriculture is changing into 'agribusiness', to use the term coined by the Harvard Business School. The grower of tomatoes may nowadays be part of the single integrated operations of the manufacture of tomato soup or tomato ketchup, just as the poultry farmer no longer expects to take his birds to market and have done with them. Instead, he sees his operations directly linked to the processing plant which itself is linked to the supermarket through which his product flows to the consumer. Understanding of the chemical basis of nutrition, of the physiological needs of different categories of people for protein and the amino acids in it, for fats and the fat-soluble vitamins they contain, for the interplay between carbohydrates and thiamine, and for the diverse other nutrients needed for well-being, is as important as it ever was. But these nutrients are provided by foods which, while being important commodities, are nevertheless chosen for complex and subtle reasons as part of the total social behaviour of individuals who possess desires for other kinds of commodities, and whose desires compete with their choice of food. Within this complex interplay, the availability of a variety of the sophisticated products of 'agribusiness' can best ensure the nutritional health of a modern community.

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This article has been contributed by **Magnus Pyke, B.Sc., Ph.D., F.R.I.C., F.R.S.E.**, Glenochil Research Station (Scottish Grain Distillers Ltd.), Menstrie, Clackmannanshire.

The market for food eaten away from home is growing. Hence the work of the Hotel and Catering E.D.C. is of increasing interest to those concerned with food production and processing.

## Hotels and Catering

J. Martin

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THE Hotel and Catering Economic Development Committee was established in June, 1966, under the chairmanship of Sir William Swallow. Over the past three years it has been very active: a number of studies with a major bearing on the industry's economic performance have been carried out or initiated, and close working relationships have been established with other national organizations with an interest in hotel and catering activity. It may be helpful before discussing some aspects of its work to give some essential characteristics of industry EDCs.

### **Economic Development Committees (EDCs)**

There are twenty-one industry EDCs and together they cover some 70 per cent of the employed labour force in Britain. They are voluntary bodies represented by persons from both sides of industry and interested government departments, under independent chairmen. Each EDC may also appoint up to three independent members.

The EDCs have identical terms of reference: in relation to their industry and within the framework of the National Economic Development Council (NEDC), they are required to examine and evaluate the whole field of activities in their industry and to encourage and recommend ways of improving the industry's efficiency.

The NEDC was created with the aim of achieving more effective ways of co-ordination and co-operation in the formulation of economic policy. Under the Prime Minister's chairmanship, it brings together Ministers of the Crown and leaders from both the management and trade union sides of industry. The EDCs were set up so that the work of the NEDC and national economic planning could be firmly based on the facts of the situation in each major industry, so that a very much wider number of people could be involved in the work of indicative planning and of investigating and recommending methods of improved industrial performance. From the industry's point of view, more weight is likely to be given to its views by government at national level if they are backed up by chapter and verse from the considered reports of a tripartite and objective body that is knowledgeable about its

industry. The work of the 'Little Neddies' was conceived therefore, in the context of the NEDC, and as part of the traffic in ideas between both sides of industry as well as between industry and government for the purpose of ensuring that the implications of national policies are understood in each industry, and that the circumstances of individual industries are considered in the preparation of policy.

The relatively informal nature of the EDCs permits the particular requirements of each different industry to be taken into account in the precise composition of each committee and in the interpretation of a committee's broad terms of reference.

The secretariat of these 'Little Neddies' is provided by the National Economic Development Office (NEDO) working under an independent director general from outside the civil service. The NEDO staff are drawn from industry, the trade unions, the universities, the civil service and elsewhere. The independence of the office is an essential part of the work of the NEDC and the 'Little Neddies'.

In forming the committee for each industry, the NEDO, acting for the Council, follows the principle that the management organizations, the trade unions and the sponsoring government departments concerned, must have a real sense of responsibility for the establishment of their committee and of involvement in the success of its work.

The three parties must, therefore, have freedom to put up the names of representatives in whom they have confidence. Members are not delegates of sectional trade interests or of the trade unions but approved 'names' jointly agreed after consideration within the trade associations and trade unions.

The chairman is selected for his capacity for leadership and generally has no direct connection with the industry concerned. That the three sides of industry jointly choose the chairman is as vital to the basic concept as that of deciding jointly to set up the committee.

The EDCs have no executive powers. Their function has been described as being 'to know and to inquire, to initiate and to prod, to advise and to seek to influence'. They operate mainly through the appointment of working groups. Neither the chairman nor the members of working groups need be members of an EDC itself but, usually, the chairman is on the EDC. It is through these groups that the resources of the whole industry can be called upon when necessary to deal with particular problems.

### **Hotel and Catering EDC**

The Hotel and Catering EDC consists of eighteen members under an independent chairman. Members are drawn from the management and trade union sides of the industry, from the British Travel Association (BTA) and from the three government departments most closely concerned with the industry (including the Ministry of Agriculture, Fisheries and Food which is the sponsor department for the catering industry), and includes three independent members and one representative of the National Economic Development Office. Since its inception meetings have been held at roughly six-week intervals: so have the meetings of the three standing working groups (marketing, manpower and economic and finance). In the first two years eighty-two meetings of the committee and its three main working groups were held; on average one meeting in every six working days. The chairman



of the three standing working groups were all members of the EDC. From time to time *ad hoc* working groups have also been set up to deal with specific single topics.

### **EDCs Working Priorities**

The EDC has established clear working priorities.

*Defining the industry.* Hotel and catering activity is weakly defined in statistical terms. Consequently, it is difficult for the firms and establishments within it to assert their common interests and to demonstrate their economic needs—and contribution—to others. The EDC has begun the arduous task of improving the industry's statistical sources and has sought to encourage firms in a number of ways to think in industry-wide terms. For the purposes of its own work the 'Little Neddy' defines the industry as covering all hotel and catering activities wherever they may be found, in both the commercial and the public sectors. This definition encompasses a field of activities very much wider than the narrow official definition contained in the 1968 Standard Industrial Classification (SIC). The SIC definition is restricted to all units whose main business is hotel keeping and/or catering and comprises hotels and other residential units including holiday camps, restaurants, cafes and snack bars, public houses, clubs and contract catering. The EDC definition is also wider than that laid down by the Department of Employment and Productivity for the purposes of the Hotel and Catering Industry Training Board. The Board covers all hotel and catering activities except those which are specifically excluded, i.e., air and sea catering, direct catering in approved schools, hospital catering and other catering operations of the Crown.

The importance of these differences in definition can be illustrated by the number of employees estimated to be within the industry; under the SIC heading, the number of employees is estimated at between 600,000 and 700,000 according to the season. The Hotel and Catering Industry Training Board definition covers 1,050,000 workers. Under the EDC definition, and according to an analysis made of the 1966 census, it amounts to between 1,350,000 and 1,450,000.

*Industry's economic role.* The EDC has attempted to encourage a better understanding of the industry's contribution to the national economy. As the fourth largest industry in Britain measured by manpower, the economic contribution of hotels and catering to the national economy and, in particular foreign currency earnings, is considerable. If all the tourist trades are grouped together, and hotel and catering is only one of these, they emerge as a principal source of Britain's foreign currency earnings exceeded by only four industries. Of an estimated total of foreign receipts from overseas visitors to Britain in 1967 of £236m about £120m (BTA estimate) was spent in hotels and restaurants. Of this probably two-thirds is spent in hotels. The share of travel in the world's invisible transactions grew 14 per cent annually between 1952 and 1964. From these figures it is possible to gauge the importance of the role that can be played by the industry in increasing exports and reducing imports through greater efficiency in the use of economic resources and in marketing its services at home and abroad.

The EDC also believes that the industry can make a contribution to the economic development of the regions, and is vital to the business life of the community. A recently completed study of the business use of hotel services should be helpful in defining the business user market.



*The more efficient use of resources.* A number of studies have been carried out by the EDC, or have been started, as a contribution to a wider industry understanding of factors contributing to higher productivity—mainly of manpower but also of capital. Among studies that illustrate this theme are a cost study of personal services provided by hotels, and studies of labour turnover, tipping, the use of convenience foods, and of new investment in hotels and catering.

*Marketing.* From the outset the 'Little Neddy' has emphasized the importance of the marketing approach as a contribution to the solution of problems in industry and the realization of market opportunities. This emphasis is demonstrated in a number of EDC market studies and publications.

### **Priorities by sector**

*Hotels.* The early work of the EDC gave priority to the hotel sector of the industry. The main reason for this was the Committee's wish to contribute to an industry and government understanding of the action that could be taken to earn more foreign currency, and to assist in the struggle to reduce the balance of payments deficit. The EDC's main contribution was a study of investment in new hotels which had some influence on Government thinking and resulted in the proposals for hotel grants and loans contained in the Development of Tourism Bill.

*Catering.* While much of the Committee's work covers all sectors of the industry (e.g., its work on the industry's statistics and forecasting in the first two years) no study of exclusive interest to caterers was completed. However, the coming year will be very different in that the projects to be completed will be of principal interest to caterers.

*Convenience foods.* The EDC, in association with the Food Manufacturing EDC, has recently commissioned Arthur D. Little, Ltd., to carry out a market study of the use of convenience foods by caterers. The study was originated in the EDC's Manpower Working Group. The hotel and catering industry is a large user of labour and its claim on the economy's manpower sources is expanding. The greater use of convenience foods by caterers is seen by the EDC to be an important way of reducing its use of manpower.

The study is comprehensive. It seeks to establish the existing pattern of convenience food usage by caterers and to provide a basis for predicting the growth of this market. It is to indicate the savings in catering resources that would result from the greater use of these foods, and the consequent increase in the use of resources by the food manufacturing industry. In this way it will be possible to establish the extent to which *total* savings in manpower and capital are likely to arise from the growth in the use of convenience foods in hotel and catering establishments. In addition the study is to seek to identify the factors which inhibit a greater use of convenience foods and the ways in which these might be overcome.

The study will be completed by November, 1969, and is likely to be published a few months later.

### **Standard catering accounts and inter-unit comparison**

Having completed the development of a system of standard hotel accounts, the EDC has commissioned the same firm of consultants, Turquand Youngs and Layton-Bennett, to extend the system to catering. In so doing, it is

following the example of the hotel and catering industry in the USA, where a system of standard accounting has been in operation for over 40 years. Standard accounting should in time enable financial comparisons to be made between catering operations throughout the industry.

The EDC believes that inter-unit comparison has an important part to play in raising management standards and efficiency. The industry contains many thousands of small independent establishments: for their managers inter-unit comparison can provide a discipline that large firms can obtain from budgets and forecasts. It is for this reason that the National Economic Development Office, on behalf of the EDC, the Industry Training Board, and the Brewers Society, have recently agreed to contribute financially to a five-year development plan for enabling the University of Surrey to expand its work on inter-unit comparisons, both financial and manpower, to all the main sectors of the industry.

### **The future**

The future work of the Hotel and Catering EDC is likely to be of increasing interest to those concerned with the production of food and food processing. The market for food eaten away from home is already big—some £500m of consumer expenditure—and is growing with higher consumer disposable income and changing leisure habits. Inevitably the interest and involvement of national planning bodies in this market must be expected to become greater.

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### **A.R.C.'s Food Research Institute**

The new buildings of the Agricultural Research Council's Food Research Institute, Norwich, were officially opened recently when his Grace the Duke of Northumberland, Chairman of the Agricultural Research Council 1958-1968, formally inaugurated the first of the Institute's Open Days.

The role of the FRI in the ARC's research programme is to carry out research necessary to ensure that both the consumer and the processor receive from the farmer and grower first-class produce, i.e., vegetables, fruit, eggs and poultry\*, in first-class condition and with a minimum of wastage. To achieve this it is necessary to define a first-class product and to devise methods for measuring those features which make it first class. Secondly, it is necessary to describe in scientific terms the changes which take place in commodities immediately before, during and after harvesting in order to discover the mechanism of these changes and factors which control them. This information is essential for the development of rational methods for the preservation of the desirable features of a commodity during short-term and long-term storage and during its transportation; it is equally essential to the breeder in his search for new varieties.

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\*Work on meat research is carried out at the ARC's Meat Research Institute, Langford, near Bristol.



## **25. Lancaster**

**R. S. Nicholson**

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BEFORE the construction of the M6 Motorway which now runs virtually the full length of the county, the image of Lancashire was of an industrial sprawl, encountered at all the southern approaches to the county and continuing for a considerable distance northwards. This industrial area, one of the oldest in the country, certainly exists in the south of the county, but there are, contrary to public opinion, many first-class rural areas north of Preston, of which Lancaster is one of the most attractive. Though lacking the scenic beauty of the Lake District further north, the district nevertheless enjoys a very pleasant situation, with a milder climate than most northern parts, and with a considerable agricultural potential.

Lancaster, city and county town, is situated at the mouth of the River Lune, and is dominated by an ancient castle on the hill; it is an old town, with port connections in years gone by. For many years it has retained its traditional character but this is now changing with the re-shaping of the town centre and the advent of the new university immediately to the south at Bailrigg. The linoleum industry provided most of the employment in the area for a long time, but the emphasis now is very much on the man-made fibre industry.

The soil type on the south side of Lancaster is a medium-heavy clay loam, whereas immediately northwards the areas are of gravel and limestone,

the workings of which are becoming increasingly important. The lowland, which is in the main gently undulating, is bounded on the east side by hill land rising to 1,500–1,600 feet above sea level, where the soil type is a peaty loam or a millstone grit formation. Annual rainfall in the immediate area around Lancaster is about 40 in. and in the more hilly districts inland towards the Yorkshire border it increases to 50–55 in. or more. Winters are not severe by many standards, and it is only rarely that snow remains for any length of time in the lowland.

It follows, therefore, that grassland is the mainstay of farming in the area and reasonable grass growth can be expected from mid-April or earlier, and throughout the summer except in an abnormally dry time. Useful grazing is usually possible until late autumn. Very little arable farming is practised, though there is a limited amount of ley farming. It is not surprising, therefore, that dairy farming is of a very high order, with an increasing number of herds being considerably enlarged.

There has always been a strong tradition for shippon housing of dairy cows, and a few years ago, to meet the needs of the smaller herds, many barn hay driers were installed as a means of improving fodder conservation. These have given very useful service, but expansion of many of the herds has necessitated changing over to silage feeding and cubicle housing, with a fair amount of interest in manger feeding. The area has long been a Friesian stronghold, with many well-known high-yielding herds, and a standard of stockmanship second to none.

The increase in the dairy herd population has occurred on the whole at the expense of the sheep flocks, which in general are only maintained on those lowland farms where shortage of accommodation for more dairy cows, except by recourse to a completely new layout, is a limiting factor.

As mentioned earlier, cereal cropping is insignificant, due largely to the competitiveness of the dairy industry and root crops such as kale have also lost popularity as better grassland management has provided a simpler but equally profitable farming system.

On hill farms with a limited acreage the farming system still centres on a small dairy herd and hill sheep, while some of the larger farms, having given up milk production due to labour difficulties or inadequate buildings, rely entirely on hill sheep and hill cattle. In the hill areas there has been a considerable swing in the past few years towards finishing store lambs and, more recently, beef stores, in an attempt to meet rising costs. This has resulted in much more housing of sheep, not only for fattening of lambs, but also for home-wintering of ewe hogs, now that away-wintering is expensive and difficult to obtain.

Grassland management on the uplands has improved over the last five to six years as a result of greater use of fertilizers, spraying of rushes, and drainage schemes.

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### **Remember the Bees !**

Bees and other beneficial insects can be killed by the thoughtless use of insecticidal sprays.

In their own interests, farmers, fruit growers, spraying contractors and bee keepers should co-operate closely to ensure that bees are protected from unnecessary dangers.

## **Cowhouses to Calfhouses**

**C. Dickens** *Agricultural Land Service, Leicester*

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WHEN a dairy farmer moves his herd to a new yard-and-parlour layout he is sometimes left with a cowshed which is still structurally sound. This change is often associated with an increase in the number of cows kept. More cows result in more calves, so frequently the farmer is hard pressed to find cheap accommodation for his increased numbers of young stock.

A Leicestershire farmer, recently faced with this problem, solved it by converting his modern double-range cowshed, built to tie 40 cows, into a calfhouse to accommodate 70–80 animals from birth to three months of age. The method of conversion was simple and could be used to adapt single-range as well as double-range cowsheds employing farm labour and readily available materials.

Basically the conversion consists of making each double standing into a separate pen of about 70–75 sq. ft to hold four calves. Constructionally, the job may be divided into three stages, i.e., the floor, pen divisions and provision for insulation and ventilation.

The mangers must first be removed and the back wall made good by cement rendering. The cow standings are then extended inwards 2 ft–2 ft 6 in. almost across the dunging channel but leaving a gutter along the front of the pens for drainage. This would then give a floor area of about 7 ft across the pen and a depth of 10–11 ft. Before laying new concrete, it is advisable to chip the old surface to provide a good bond and it is essential to make sure that the fall is continuous from the back to the front of the pen to assist drainage, as bedding tends to become very wet while the calves are on liquid feed.

Although in the case described, the floor was not insulated, some farmers would consider this advisable. This can be done by putting a layer of an insulating material such as 1 in. of polystyrene on a damp-proof membrane placed on the extended cow standing and covering it with 3 in. of concrete. Insulating the floor adds to the cost but if plenty of straw is available there is probably little advantage to be gained by doing it, as calves are more likely to be at the back of the pen on the old floor.

The sides of the pen can be formed by extending the solid concrete stall divisions to a 4 × 4 in. corner post set in line and fixed in the floor at the front of the pen. When the floor is laid, sockets to take the posts can be made in the concrete floor and the posts concreted in when assembling the pen divisions. The side divisions can be made of 3 in. × 1 in. timbers clamped on the end of the pen divisions and nailed on to the corner post; 3 in. × 1 in.



cross timbers and 3 in.  $\times$  1½ in. upright timbers would be suitable to make the frame for the pen front. Vertical pieces of 1½ in.  $\times$  1½ in. timber, spaced 6-7 in. apart, with every third vertical movable should be set in the frame to form a simple yoke. The yokes should be held by a metal pin pushed through a hole drilled in the frame and the vertical timber member. Holders to take the buckets can be fitted on the bottom rail of the pen front and the whole hinged on to the corner post to allow access into the pen.

All softwood needs to be pressure-treated with a suitable preservative, which affords the best and safest protection. Owing to the susceptibility of calves to lead poisoning, paint is not recommended as an alternative, unless it can be guaranteed lead free.

While in this particular case no special arrangements were made for insulating and ventilating the calfhouse, in some conversions it may be necessary to consider the need for this. Calves thrive in a warm environment, 60-65° F (15-18° C) and cannot tolerate cold draughts. If the calfhouse is cold or a lot of condensation occurs on the underside of the roof or ceiling it will generally be necessary to insulate. A rigid roof lining of proprietary insulation to give a 'U'-value of 0.20-0.24 with the necessary vapour seal on the underside will, in most cases, cure the problem. Ventilation can be arranged without having to resort to fans. Air inlets can be simply made by fixing hopper type windows opening inwards with solid side cheeks. Any of the old cowhouse inlet ventilators which blow cold air on to the calves' noses should be stopped up and those higher up the wall fitted with baffles to direct the cold air upwards. Air outlets in the form of chimneys running up clear of the ridge, made of timber and insulated, are the most suitable to draw out the stale air, with a hinged flap or slide at the bottom to control the outward flow of air.

No hard and fast rules can be given here of the size of openings to use as the ventilation rate required varies with the size and position of the house. To obtain an even airflow through the house the inlet area should be greater than the outlet area.

In the conversion described, provision was made for feeding hay and concentrates by fixing small hayracks and mangers made of timber and wire mesh. By clipping these on to the timber rails of the side pen divisions they can be easily filled by the stockman without having to enter the pen. The original water bowls were left at the back of the pen but, preferably, if water is to be given *ad lib*, the bowls should be fitted to the front of the pen thereby avoiding the whole bed becoming saturated should the water bowls leak.

If an old dairy is associated with the building under conversion, it can provide an ideal place in which to prepare liquid feed and for cleaning buckets, as the original water heating equipment and wash troughs can be used while an adjacent feed store would retain its function.

Clearly there are many ways of converting old cowsheds to calfhouses and there is a wide range of proprietary equipment from which to choose. The conversion, on which this article is based, enabled the farmer to make full use of many of the fittings already in the cowshed; this avoided the expense of making entirely new pens and relaying a new concrete floor throughout, thereby restricting the cost to about £3-4 per calf. With quotations of £50 or more per calf place for new calfhouses an old cowhouse can suddenly take on a new value.



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# in brief

- The Forestry Commission's half century
  - Farm buildings and amenity
  - New film on cereal cultivation
- 



*Integration with agriculture. Plantations above valley farms at Brecon Forest*

## **The Forestry Commission's half century**

WHEN the Forestry Commission was set up in 1919 it succeeded to an economic policy which had rested heavily on cheap imported timber for the past 150 years. In the light of mounting national prosperity that accrued from the Industrial Revolution, Britain saw no need to plan, grow and conserve her own resources of wood. Her exports were more than sufficient to buy what she needed. The 1914-18 war shattered this complacency, and in 1917 Lloyd George appointed a Forestry Sub-Committee under Sir Francis Acland to frame the country's first national forest policy. The sequel was the Forest Act of 1919.

Under the direction of its first Chairman, Lord Lovat, and technically piloted by Roy (later Lord) Robinson, a rationalized plan for the future production of Britain's timber was set in motion. Nurseries were established and the first trees planted in 1919 at Eggesford Forest, Devon. Five years later the New Forest and the Forest of Dean, together comprising 75,000 acres of woodland, were added as a nucleus in which to gain experience in management and the training of staff. By the time of the outbreak of the second world war, which was to drain such timber stands as we had to an all-time low, 600,000 acres of new woodlands had been planted. The big expansion after the war, which had its roots in the Government White Paper, *Report on Post-War Forest Policy*, set its sights on 5 million acres of

'economically productive and well-managed woodlands' by the year 2000, part owned by the Commission and part by private landowners.

Today, fifty years after its inception, the Forestry Commission is the biggest single estate owner in Britain, responsible for 2,850,000 acres. By 1970 it will hold 1,800,000 afforested acres, with another 200,000 acres awaiting planting. An additional 1½ million acres of well-managed tree crops will be in management schemes on private estates. Proposed planting by the Commission should add a further 500,000 acres by 1978, plus private planting of 200,000 acres, bringing the total to 3,700,000 acres. This is an impressive proportion of the end-of-the-century target which, by an increased share of the expanding home timber market, should save a sizeable amount of foreign currency. Except for food and oil, timber is our most costly import (more than £500 million a year).

The story of the Commission's achievement in establishing and extending Britain's timber crop in over 400 forests and nearly 4,000 schemes for dedicated and approved woodlands from the extreme north-east of Scotland to Cornwall and throughout Wales, is well told by Herbert Edlin in a new, attractively produced Forestry Commission booklet (No. 23) entitled *Timber! Your Growing Investment\**. From seed to standing timber he has outlined the whole complex of our silviculture and shows how modern methods of growing and harvesting timber have left tradition far behind. Mechanized in every conceivable aspect, except that of forest planting, productivity has risen beyond anything that could have been foreseen in the early days; and greatest of all in the nurseries, where 100 million trees are raised every year. Research begun in 1946 at Alice Holt in Surrey will shortly be extended to the Edinburgh Centre of Rural Economy, and at present there are no fewer than 366 major experiments scattered throughout the country.

Conservatively valued at £300 million, our planned forestry, producing the right kind of timber for modern industrial needs, is an asset won from the poorer soils of Britain. It is integrated with agriculture, it augments and conserves scenic amenity and offers sanctuary to wild life that might otherwise become extinct. The Commission may well be proud of its first fifty years.

#### **Farm buildings and amenity**

Good farm buildings reflect good farming; they are, or should be, purpose-built to do their job as efficiently as any other piece of equipment that writes prosperity across Britain's rural landscape. A no less important consideration is the conservation of amenity, which is now specifically framed by the Countryside Act of 1968 and is the special concern of the Countryside Commission. Ideally, a set of farm buildings should be conceived as a whole, integrating well with each other in design, convenient of access and sited in such a way as to conform, and not contrast, with the natural beauty of the area. In practice it is often a matter of adding a building here and a building there—a piecemeal policy that is rarely satisfactory and, without careful thought, can produce an ugly clutter rather than a harmonious whole. The answer may often lie in siting a new building away from the old, allowing it to stand in its own right in its own environment.

Where once farmstead building was of local material, locally constructed by a race of craftsmen now lost to us, and on a smaller scale than that required by modern farming, today pre-fabricated structures are found replicated throughout the length and breadth of the country. Is there not here an opportunity to which designers might set their minds? Camouflage is no answer to a building that is out of harmony with its surroundings, and inasmuch as farm buildings represent a considerable capital investment, it is essential that they should be absolutely right in the first place. Functional value and aesthetic quality are not irreconcilable, as many good examples on some farms today show only too well. New building techniques should obviously continue to be used to the full, but equally planning should precede it. Afterthoughts can be expensive.

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\*H.M. Stationery Office, price 6s. 6d. (7s. 2d. by post).

### New film on cereal cultivation

LEARNING the hard way, cereal farmers are beginning to decipher the writing on the wall as far as intensive corn growing and the importance of meticulously clean stubbles are concerned. The rising incidence of foliar diseases, and consequentially poorer yields that have marked recent years, has clearly to be arrested. Whereas we might otherwise look confidently to spring cereal yields of at least two tons/ac, and winter varieties even more, barley and oats are now commonly around the 30 cwt mark, and wheat only marginally better. In the disease danger that lies latent in stubble trash, volunteer cereal plants constitute the major threat, but little less serious are the grass weeds which carry over the take-all fungus and incompletely destroyed straw which is a natural host for eyespot and rhynchosporium.

Suggestions for saving time and the labour tied up in the chore of stubble cleaning have been embodied in an interesting film, *Cereals in the 70s*, made by Plant Protection and is further emphasized in a complementary booklet with the same title. Both analyse these two predominantly important problems that confront cereal farmers and advocate the use of a bipyridyl herbicide, as providing the basis for a practical solution. In addition, they advance the idea of growing cereals more cheaply by replacing ploughing and other traditional cultivations by a single spraying with the herbicide, plus the use of a triple-disc drill capable of drilling into uncultivated land as well as in normally prepared seedbeds. The advantages of such a facility in saving time, money and labour are obvious, but it could also mean that the choice of timing for cultivations would be dictated less by the vagaries of the weather. Both the film, which is 16mm, in colour and runs for 21 minutes, and the booklet can be obtained from I.C.I., Millbank, London, S.W.1.

AGRIC

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### Publication of Part 1 of The Report of the Committee of Inquiry on Foot-and-Mouth Disease

*Part 1 of the Report of the Committee of Inquiry on Foot-and-Mouth Disease* (the Northumberland Committee) has been published by H.M. Stationery Office. The policy recommendations of the Committee and the Government's decisions on them were announced on 1st May but the full Report could not be published at that time because of industrial action.

The Report contains a description of the disease and its world distribution; an historical record of the 1967/68 epidemic; an account of the various measures taken to prevent and control the disease throughout the world; and a discussion of the policies which might be adopted in Great Britain to reduce the risk of introducing foot-and-mouth disease virus and the risk of future epidemics. It covers the control of meat imports, the slaughter policy, and the arguments for and against the various forms of vaccination. The Report is supported by maps, tables and colour photographs of foot-and-mouth disease lesions and is important for anyone interested in foot-and-mouth disease.

Copies of the Report can be obtained from H.M. Stationery Office, price 15s. (by post 15s. 8d.).

# Books

## **Soil-Plant Relationships. (Second Edition).**

C. A. BLACK. John Wiley and Sons, 1968.  
£8 15s.

The literature of soil science contains a vast amount of information on the origin and nature of soils, processes of soil formation and the properties—physical, chemical and biological—of soil constituents and soil components.

It also contains studies of the effects of soil conditions and soil behaviour on the growth and development of crops; the causes of nutritional deficiencies and the use of soil conditioners and fertilizers to increase and maintain the yield of crops; and also attempts that have been made to assess and integrate the main factors influencing soil fertility and crop production.

This book assumes that the reader has already acquired an understanding of soils and plant physiology and examines the relevance and application of a number of well-studied aspects of soils to the requirements and growth of plants. It contains nine chapters on soil characterization; water; aeration; exchangeable bases; soil acidity; salinity and excess sodium; nitrogen; phosphorus; and potassium. In each chapter the physical, chemical or biological concepts are outlined in relation to soils and then related to crop requirements and behaviour. Treatment takes the form of a review of the literature, quotation from individual papers and discussion of the evidence.

The book has developed from a course in soil-plant relationships given by the author to students in the department of agronomy of Iowa State University. The outlines of science concepts are simplified, no doubt to make them better understood by agronomy students and, on the whole, are successfully treated—though the concept of free energy is not one—and those seeking a fuller and more rigorous treatment must turn to the literature cited. The latter appears at the end of each chapter and contains a useful selection of the relevant literature but with

omission of several authors who have made fundamental contributions.

The book should be of interest and considerable value to all those using methods of soil examination and analysis for assessing soil conditions and soil properties and their possible effects on crops, not the least for its critical examination of evidence. It may suggest to them a re-appraisal of techniques and, if it is necessary, a realization of the complexities in studying soil-plant relationships and the effects the latter have on soil productivity.

N.H.P.

## **The Veterinary Annual 1968. Edited by**

W. A. POOL. John Wright and Sons, 1968. 65s.

The ninth issue of the *Veterinary Annual* has been reduced in size to 295 pages and its cost increased by two shillings but, nevertheless, this is still a book well worth buying. The layout has not changed and 34 authors have contributed eight articles on current developments and 39 reviews of current literature.

Once again, one could criticize the use of the term 'current developments' to describe an article such as 'The Philosophy of Diagnosis', although 'Humane Slaughtering of Food Animals' is topical even if contentious. Similarly, reviews of current literature is a misnomer in several instances. The article on the 'Regulation of Body Temperature' has many references which are by no means recent and 'Future Developments in Animal Feeding' is not a review at all. There would be no complaint if all the reviews were of the standard of 'Parasitology' and 'Reproduction and Reproductive Disorders'—both of which cast a wide net over all recent work of importance.

There is a substantial error on page 288. The Diseases of Animals Act was made in 1950 (not 1956); the controlled area referred to only concerns foot-and-mouth disease (which is not mentioned); and the restriction is on the use of milk which has originated inside, not outside, the controlled area.

These critical observations in no way detract from the continued usefulness of this excellent publication. There is much which is of interest over a wide field for those concerned with both veterinary science and animal husbandry.

R.D.L.

**The Problems of Birds as Pests.** (Institute of Biology Symposia No. 17). Edited by R. K. MURTON and E. N. WRIGHT. Academic Press, 1968. 70s.

Since its foundation, it has been the practice of the Institute of Biology to hold a two-day conference each autumn on such broad ranging subjects as 'The Biological Productivity of Britain', 'The Better Use of The World's Fauna for Food' and, in 1968, 'Biology and Ethics'. The symposium reviewed here was the first devoted to birds and their impact on man's activities, with one day on birds and aircraft and the other on birds and agriculture.

During the twentieth century there has been an increasing interest, both scientific and aesthetic, in natural history and a concurrent awareness of the need for conservation of nature and natural resources generally. Although this led, at first, to an excessively protective attitude towards wildlife, it is now accepted that control is an integral part of conservation and wildlife management. The British yield to no one in their affection for birds, as witnessed by our legislation and the abundance of ornithological societies, including one in the Royal Air Force. But collisions do take place between birds and aircraft, with loss of life and costly repairs. Highly productive and intensive farming is vulnerable to damage by birds, while in urban areas, birds can be a public health problem in food premises and elsewhere.

Biologists working in Britain, France, Canada, the U.S.A. and Africa participated in the symposium which, besides discussing damage and techniques of control by killing, gave due attention to the protection that can be achieved by bird scaring. The use of radar for detecting birds, the effectiveness of controlling them by modifying the habitat, and the use of recorded distress calls for scaring them all emphasized the need for thorough biological studies of birds before control measures can be evaluated.

H.V.T.

**Soils of Romney Marsh.** (Soil Survey of Great Britain).

Despite its long gestation period this Bulletin is a very welcome addition to the gradually increasing numbers of Soil Survey publications in this country. It is of particular interest because it deals with an area of highly fertile soils which in the past were

rightly famous for their first-class grassland but latterly have become increasingly noted for arable production. The impact of this change on the soil's behaviour is gradual and of much significance for the farmers of the Marsh. This edition will prove valuable backcloth for future studies into the topic.

The Bulletin which covers about 100 square miles is divided into five sections which describe in turn the variation in parent material, soil genesis mapping and classification, soil series, landscape associations and agriculture. The original request for this survey arose from the frequent occurrence of manganese deficiency in arable crops of the Marsh and the need to predict where it would occur. The map shows clearly the widespread distribution of the three soils, the Newchurch, Agney and Romney Series on which the deficiency is commonly found and this will undoubtedly be of value to farmers and advisers in the area.

Copies may be obtained from the Librarian, Rothamsted Experimental Station, Harpenden, Herts. 30s.

D.B.D.

**Down to Earth.** (Farming as a Career).

DONALD KNIGHT. Educational Explorers, 1969. 21s.

This thoughtful, informative and well-written book owes much of its impact to the autobiographical approach. The author had no farming background, no capital and no influential friends; only a firm resolve to work and save for a farm of his own. The account of his early, uphill struggles to do this should give encouragement to any would-be farmer who is imbued with the spirit of 'where there's a will there's a way'.

Apart from studying for an agricultural degree or diploma, the would-be farmer needs to obtain practical experience of farm work early in his career. Always 'down to earth', Mr. Knight admits that acceptance for his first job in farm management was due less to his studies than to his practical know-how of work on the farm.

With the present high cost of farms and of running them the farmer must be ever alert to find ways of reducing costs, ready to try out, even invent, improved methods and know when to seek the advice of experts. These and many other essential points are dealt with, often in an ironically amusing way likely to hold the attention of even the casual reader.

A.J.L.L.



## books received

*Documentation in Agriculture and Food.* No. 83. *Co-operative Research on input/output relationships in cow milk production.* Organisation for Economic Co-operation and Development. 21s.

Ministry of Agriculture, Fisheries and Food

Experimental Husbandry Farms

Terrington *Ninth Annual Review 1968*

Gleadthorpe *Report 1968*  
Boxworth

High Mowthorpe *Ninth Annual Report 1968 and Farm Guide 1969*

Pwllpeiran *Farm Guide and Report 1968*

Rosemaund *Farm Guide 1969*  
Drayton

Great House *Report and Guide to experiments 1969*  
Liscombe

Copies may be obtained from the Farm Directors.

*Animal Production.* Vol. 11. Part 2. Journal of the British Society of Animal Production. Oliver and Boyd, 1969. 25s.

*Agricultural Mechanization.* PTO-Driven Machines for the Rotary Cultivation of the Soil. (AGRI/MECH/39). D. Toma. Economics Commission for Europe. United Nations, New York, 1969. 60 cents.

*Agricultural Trade in Europe.* Recent Developments (prepared in 1968). The European Market for Viticultural Products: Wine and Table Grapes, (ST/ECE/AGRI/32). Economic Commission for Europe. United Nations, New York, 1969. \$1.75.

*Grain Crops.* A Review of production, trade, consumption and prices relating to wheat, wheat flour, maize, barley, oats, rye and rice. Commonwealth Secretariat. 40s.

*Farm Organisation and Incomes in South West England 1967-68.* Report No. 175. University of Exeter. 7s. 6d.

*An Economic Study of Pig Production in South West England 1967-68.* Report No. 174. Estelle Burnside and R. C. Rickard. University of Exeter. 2s. 6d.

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Front cover and P.309 R. Hart. P.316 I. B. Mathieson. P.320 R. P. Charlesworth. P.331 *Farmer and Stockbreeder*. P.347 R. S. Nicholson. P.351 Forestry Commission.

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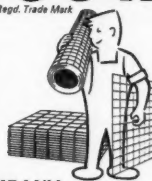
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